S Chronology,
634.9618Gates Park
USggp prescribed fire,
1989 July 10 to October
1.2 30, 1988, Bob
Marshall
Wilderness

Agriculture

Lewis and Clark
National Forest
P.O. Box 871
Great Falls, MT.
59403

CHRONOLOGY
GATES PARK PRESCRIBED FIRE

July 10 to October 30, 1988

Bob Marshall Wilderness

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Appendix **Volume II**

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Chronology, Gates Park prescribed fire,
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GATES PARK PRESCRIBED FIRE CHRONOLOGY APPENDIX

LIST OF APPENDIX MATERIAL - Volume II

A. Fire Detection Report
B. Daily Fire Weather/Fuel Moisture and Fire Size
C. Historic Weather Report
    1. Accumulative precipitation percent of normal
    2. Snowpack
    4. Energy Release Component 1983-1988 plotted against Ten-Year Average
D. Beartop Lookout Weather Data
E. Air Quality Monitoring Report
F. Escaped Fire Situation Analysis and Contingency Plan
G. Final 209
H. Damage Inventory and Rehabilitation Plan
I. Post Fire Studies
J. 1988 Fires - Date Detected - Status - Final Size - Final Cost
K. Up Front Fact Sheets and Distribution List
L. Group letters written to Permittees, Outfitters and other users
P. Wilderness Fire Program - Fire Ecology
Q. Gates Park Weather Chronology Sept. - Oct.
R. Fire Intensity Map
S. Fire Behavior Computations for July 25-28 Fire Behavior/Fuels Report
T. Photo Record and Typical Fuels
V. Map Chronology, Fire Spread and Actions Taken
W. Gates Park Fire Projections Map 7/13 and 7/23

USDA-FOREST SERVICE RI-5120-28 (4/70)

FIRE DETECTOR REPORT

NAME OF FIRE Gates Park Fire
(TO BE USED THROUGHOUT THE FIRE)

REPORTING UNIT NUMBER _____

RANGER'S FIRE NUMBER _____ SUPERVISOR'S FIRE NUMBER _____

DATA FOR INITIAL REPORT:

1. DETECTION UNIT REPORTING Bear Top
2. LOCATION BY LANDMARKS 2 miles NW Gates Park G.S.
3. 1/4 SEC. NW SEC. 25 T. 24N R. 11 W
4. BASE OF SMOKE SEEN: YES _____ NO _____
5. AZIMUTH 282° 49'
6. VERTICAL ANGLE -4° 18'
7. ESTIMATED SIZE Point Source
8. EXPOSURE _____
9. SPREAD: RAPID _____ MODERATE _____ SLOW ✓ Steady

ADDITIONAL INFORMATION ON FIRE:

10. POSITION ON SLOPE 1/3 up from Creek
11. SLOPE: GENTLE _____ MODERATE _____ STEEP _____
12. FUELS: _____
13. WIND: SPEED _____ DIRECTION _____
14. SMOKE: COLOR White VOLUME Mod. DRIFT Straight up
15. OTHER INFORMATION: _____

16. DISCOVERED: DATE Mon 7/11/88 TIME 3:25 PM

REPORTED TO: CHOTEAU DATE: 7/11 TIME 5:25 PM

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APPENDIX B

GATES PARK PRESCRIBED FIRE
Daily Fire Weather/Fuel Moisture and Fire Size

1988	Benchmark RAWS				Beartop Lookout	Gleason Fire Weather	Fire Size - Acres
Date	Max R/H[1]	Min R/H	Max Temp	Min 1 HR	Wind PPT	ERC (Ave) HR 10-yr[2] TH	At Days End
6/30	95%	18%	70°	5%	Not Manned	20 (21) 20%	N/A
7/1	100	27	74	5	"	24 (21) 20	"
7/2	100	30	77	6	"	26 (21) 20	"
7/3	76	35	75	5	"	28 (22) 20	"
7/4	100	56	69	10	"	18 (22) 20	"
7/5	100	No Data			"	16 (22) 20	"
7/6	No Data				"	25 (21) 19	"
7/7	100	21	70	5	"	28 (21) 19	"
7/8	100	16	80	4	"	28 (21) 19	"
7/9	100	26	96	5	"	33 (22) 18	"
7/10	100	30	77	6	"	? (22)?	"
7/11	100	26	82	5	No Data	34 (22) 18	⅛-⅓Acre
7/12	76	31	61	5	SW10 -	34 (23) 17	60
7/13	71	45	69	7	SSW12T	39 (23) 16	60
7/14	88	42	65	6	W5 NW10 0.02	37 (25) 16	60
7/15	100	23	73	5	SW10 -	38 (25) 16	~ 85
7/16	100	20	76	4	W5 -	38 (26) 16	120
7/17	94	22	74	4	WSW7 -	41* (26) 16	165
7/18	100	31	68	7	calm -	39 (27) 16	165
7/19	100	30	73	5	calm T	39 (28) 16	250
7/20	100	13	85	3	SW15 -	42 (29) 15	285
7/21	86	12	86	3	SW10 -	47 (29) 14	731
7/22	67	19	84	4	W9 -	47 (30) 14	1314
7/23	84	22	81	4	SW7 -	48 (29) 14	1554
7/24	93	18	83	4	W7	50 (28) 14	1674
7/25	89	11	89	3	W2 -	49 (27) 13	2097
7/26	75	14	90	3	WNW7 -	55 (29) 13	3072
7/27	70	17	85	4	WSW20 -	54 (29) 13	3636
7/28	49	18	81	3	SW20 -	No Data	6379
7/29	74	16	84	3	SW7 -	57 (31) 12*	7266
7/30	84	15	86	3	W15 -	61 (30) 12	8364
7/31	87	17	83	3	No Data	59 (30) 12	14,832

1988	Benchmark RAWS				Beartop Lookout	Gleason Fire Weather	Fire Size - Acres
Date	Max R/H[1]	Min R/H	Max Temp	Min 1 HR	Wind PPT	ERC (Ave) HR 10-yr[2] TH	At Days End
8/1	72	16	71	7	"	59 (30) 11	14,832
8/2	100	38	61	7	"	54 (29) 11	14,832
8/3	100	20	73	5	NE2 0.01	53 (28) 11	14,832
8/4	89	19	81	4	WSW5 -	54 (26) 11	15,107
8/5	84	13	87	3	SW10 -	57 (27) 11	16,679
8/6	85	25	66	5	W20 0.04	56 (27) 11	17,063
8/7	83	21	70	5	calm -	52 (26) 11	17,393
8/8	100	19	75	4	SW8 -	53 (26) 11	17,393
8/9	52	23	81	4	W8 -	57 (26) 11	17,758
8/10	88	15	82	4	W8 -	59 (27) 11	"
8/11	71	32	76	6	W12 -	57 (27) 11	"
8/12	100	25	80	5	S8 -	57 (26) 11	"
8/13	98	29	73	8	NE8 0.47	52 (25) 11	"
8/14	93	20	75	4	WSW15 0.08	52 (24) 11	"
8/15	79	23	78	4	NE10 -	54 (24) 11	20,798
8/16	100	27	74	6	W8 0.11	No Data	20,798
8/17	100	26	79	6	S10 -	48 (25) 11	20,798
8/18	94	23	73	5	SW12 -	54 (23) 11	20,798
8/19	94	9	79	3	SW7	55 (22) 11	20,798
8/20	42	23	65	4	SW15 -	54 (23) 11	20,798
8/21	88	23	67	5	W5 -	53 (22) 11	20,798
8/22	95	14	78	4	W10 -	54 (22) 11	21,207
8/23	84	14	85	3	E&W9 -	55 (21) 11	22,451
8/24	85	14	86	4	E&SW10 -	59 (22) 11	26,102
8/25	87	16	85	4	SE&SW15 T	58 (23) 11	26,372
8/26	90	38	65	8	ENE9 0.11	32 (24) 12	26,655
8/27	100	30	75	6	E&SW5 -	No Data	26,655
8/28	100	13	82	4	SW5 -	51 (27) 12	26,982
8/29	76	14	84	3	SW15 -	55 (28) 12	27,334
8/30	42	12	77	2	WNW7 -	57 (26) 11	28,828
8/31	82	13	77	3	Var 3	59 (24) 11	29,246

1988	Benchmark RAWS				Beartop Lookout	Gleason Fire Weather	Fire Size - Acres
Date	Max R/H[1]	Min R/H	Max Temp	Min 1 HR	Wind PPT	ERC (Ave) HR 10-yr[2] TH	At Days End
9/1	84	No Data			Var 3 -	60 (24) 11	29,246
9/2	70	16	82	4	SE&SW13 -	61 (24) 11	30,453
9/3	89	24	82	5	Var 10 -	62 (25) 11	32,813
9/4	93	16	91	4	SW5 -	63 (25) 11	32,813
9/5	87	12	86	3	W6 -	61 (24) 11	34,237
9/6	71	11	81	3	W40 -	62 (24) 11	42,413
9/7	41	26	62	5	W25 -	63 (23) 11	47,246
9/8	80	21	68	4	W15 -	66 (25) 10	50,396
9/9	80	20	78	5	WSW25 -	65 (26) 10	50,396
9/10	93	54	47	11	N&E10 0.02	No Data	50,396
9/11	100	93	39	22	No Data	24 (24) 16	50,396
9/12	100	36	59	12	"	28 (23) 16	50,396
9/13	100	36	66	7	SE10 0.45	31 (23) 16	50,396
9/14	100	23	78	5	N&E7 -	34 (24) 16	50,396
9/15	100	19	76	5	SW&NW16-	36 (23) 17	50,800
9/16	100	27	64	6	WSW8 T	32 (22) 17	50,800
9/17	100	83	40	18	E14 -	19 (19) 17	50,800
9/18	100	54	48	13	Var 6 0.59	19 (18) 17	50,800
9/19	100	79	43	21	WSW14 -	0 (17) 18	50,800
9/20	100	73	45	13	Var 6 0.06	16 (20) 18	50,800
9/21	100	35	57	7	W10 T	27 (21) 18	50,800
9/22	100	22	58	6	NW5 -	26 (22) 19	50,800
9/23	100	24	59	6	Not Manned[3] [.04]	26 (22) 19	50,800
9/24	100	23	60	5	Not Manned	25 (21) 20	50,800
9/25	100	37	60	10	" [.04]	24 (20) 19	50,800
9/26	87	44?	56+?	8-?	" [-]	23 (20) 19	50,800
9/27	100	74	48	16	" [.18]	0 (19) 19	50,800
9/28	100	45	53	9	" [-]	15 (17) 20	50,800
9/29	100	29	72	6	" [-]	25 (15) 20	50,800
9/30	99	31	72	6	" [-]	27 (14) 20	50,800

1988	Benchmark RAWS				Beartop Lookout	Gleason Fire Weather	Fire Size - Acres
Date	Max R/H[1]	Min R/H	Max Temp	Min 1 HR	Wind PPT	ERC (Ave) HR 10-yr[2] TH	At Days End
10/1	100	37	70	8	* [-]	Station closed[4] [25] [20]	50,800
10/2	100	48	64	8	* [-]	[23] (-) [20]	50,800
10/3	100	51?	56+?	9-?	* [-]	[22] (-) [19]	50,800
10/4	100	25	68	7	* [-]	[25] (-) [19]	50,800
10/5	100	25?	70+?	6?	* [-]	[25] (-) [19]	50,800
10/6	100	16	73	5	* [-]	[27] (-) [19]	50,800
10/7	100	No Data			* [-]	[27] (-) [19]	50,800
10/8	No Data				* [-]	[27] (-) [19]	50,800
10/9	No Data				* [-]	[27] (-) [19]	50,800
10/10	100	18	80	5	* [-]	[27] (-) [19]	50,800
10/11	100	22	77	6	* [-]	[28] (-) [18]	50,800
10/12	100	18	74	5	* [-]	[28] (-) [18]	50,800
10/13	97	28	66	6	*	[27] (-) [18]	50,800
10/14	83	No Data			----	[27] (-) [18]	50,800
10/15	No Data				---	[0] (-) [20]	50,840

[1] Preceeding Night
[2] 1973 thru 1974
[3] Benchmark RAWS Data used [-]
[4] Benchmark RAWS Data used. Insufficient Annual Data to Develop 10-year Average
* 90th percentile = 41 ERC
* 12% is considered critical level for Thousand Hour Fuel Moisture

APPENDIX C

GATES PARK PRESCRIBED FIRE

Fire Behavior Analyst' Role In The Application Of
The Wilderness Prescribed Fire Plan

Prepared By

Everett M. "Sonny" Stiger

Fire Behavior Analyst

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For: Lewis & Clark National Forest and
Rocky Mountain Ranger District
U.S.D.A. Forest Service

Dale Gorman, Forest Supervisor

Richard Smith, Fire Staff Officer

Robert Casey, District Ranger

Norman Kamrud, District Fire Management Officer

INTRODUCTION

It seemed that we were unable to make acceptable long-range projections of freeburning fires in 1988. The Gates Park Prescribed Fire was no exception. A review of some pre-season weather indicators may have helped us do a better job of projecting the size and shape of the Gates Park Fire over the long term. Fire Behavior Analysts are generally trained to make short-range projections, in the 24-hour range. By the same token, weather forecasting is reliable only for the short term. Anything past a few days is very speculative. Projections beyond ten days, both for the National Weather Service and Fire Behavior Analysts is very shakey at best, but a thorough analysis of pre-season weather may help us make better projections.

FIRE BEHAVIOR ANALYST'S ROLE

The Fire Behavior Analyst is a key member of the Impact Analysis Team on complex wilderness fires. One of the duties of the Impact Analysis Team is to predict fire behavior based on:

1. Current weather conditions and forecasts
2. Rate and direction of spread
3. Fuels and natural barriers
4. Projected fire size and smoke dispersion
5. Fire intensities and resulting fire effects.

The Fire Behavior Analyst is obviously the primary source for this information. After a thorough review of how this was done in 1988, I would also add:

6. Pre-season indicators:
   - Snow-pack
   - Over-winter precipitation
   - Thousand-hour fuel moisture percent
   - Energy Release Component compared to averages
   - Climatology
   - Fire History

The Team is asked, among other things, to determine benefits and damages, both on-site and off-site, giving particular emphasis to threatened and endangered species, their habitats, and to downstream effects. In order to make a reasonable assessment of these effects, it is essential that the FBA provide as accurate as possible, an estimate of final size, and the type of fire behavior to be expected. He needs to make the best projection possible of:

1. Size and shape under present and foreseeable conditions

2. Maximum size and shape under serious conditions

3. Expected fire behavior

4. Expectations about the kind of season -- Above normal? Normal? Less than normal?

All of this analysis should take place as quickly as possible following detection of a possible prescribed fire, and certainly within 24 hours. From this analysis the specialists can estimate impacts on their respective resources.

The decision maker can then weigh this information and make an intelligent decision on whether to call a particular start a prescribed fire.

WHAT WAS DONE

The projection made on July 11, 988, was a total of 1,800 acres to be expected under serious conditions, 320 acres under expected conditions. On July 13, 1988, a 30-day projection was made that estimated total size to be 5,100 acres by August 15. This was predicated on having a 20-person smokejumper crew (or one Category I IR Crew) and the necessary support equipment, plus aerial retardant drops as necessary; (These, of course, were not available due to other higher priority fires.) but, primarily on the fact that the fire plan fuel map prepared in 1981 and '82 indicated that Fuel Model 8 (in this case Lodgepole pine with very little undergrowth) dominated the vegetation to the east of the fire, and therefore, spread to the east would be minimal. Our assessment of Fuel Model 8 under conditions we have experienced, is that spread through this fuel model is very limited.

The fire's actual size on August 15th was 20,8000 acres!!

On July 23, 1988, the Incident Plan was updated to indicate that the burned area expected would be 10,000 acres+, under serious conditions, and 6,000 acres under foreseeable conditions. This size was predicated on *two* Category I IR Crews, plus support, to hold the fire from moving further east. The fire, at this time, was about 2,000 acres. By July 31st, the fire had made a major run to the east and was estimated to be 14,800 acres!! The final size was 50,850 acres.

PRE-SEASON INDICATORS

Can we improve our projections using pre-season indicators?

Knowing now what happened in 1988, we may be able to make some correlations that will help us make better projections in the future. These indicators are:

1. Over-winter snowpack and precipitation

2. Thousand-hour fuel moisture and Energy Release Component

3. Climatology

4. Fire History

1. *Over-Winter Snowpack and Precipitation*

The SCS snowpack records were reviewed for the winter of 1987-88. The snowpack was below average for the entire winter in the drainage basins affected by the Gates Park Fire. (See Figure 1) Since October 1, 1987, through the end of May, 1988, the accumulated mountain precipitation totaled about 75 percent of average in these basins. Reviewing these records back to 1985 indicated that the snowpack in these basins has been below average each winter, at least since 1985. This would indicate a possible accumulative effect on large dead (1,000-hour timelag) fuel moisture and soil moisture. The Palmer Drought Index may also reflect this. Rothermel has suggested that drought, i.e., low soil moisture, may have been a major contributing factor to the extreme fire behavior experienced in 1988.

Measurements made in the field indicated that live foliage moisture was about the same in 1988 as for a "normal" year, but that trees give off great amounts of moisture when burning. "Normal" soil moisture may have a dampening effect on fire behavior, whereas during periods of low soil moisture, there is a lack of moisture available for transportation, thus, extreme fire behavior.

Accumulative over-winter precipitation has been recorded for the past several years at key stations surrounding the Bob Marshall Complex. These stations indicate a severe shortage going into the 1988 Fire Season, as compared to the past few years. (See Figure 2) These figures are kept up to date and are currently accessible at National Weather Service offices. It is interesting to note some key months looking at these charts. The North Hill Fire, a major fire, occurred in August 1984 just a few miles north of Helena, Montana. June and July were bad fire months in 1985 Region-wide; then considerable precipitation was received in August that ended the fire season. Precipitation for the month of August at Helena was 205% of normal! The charts generally show that we went into 1985 short of moisture, and this continued through July, particularly the charts for Augusta and Choteau. *All the charts show significant shortages during the winter of 1987-1988.*

The accumulative precipitation percent of normal for the stations surrounding the Bob Marshall Complex as of June 1, 1988 was:

Helena	75%
Great Falls	50%
Choteau	50%
Lincoln	90%
Seeley Lake	73%

Even though Lincoln shows only slightly below average by the end of May, a closer look at the chart, Figure 2, shows low over-winter moisture as well as the entire year of 1987. Precipitation for October of 1987 at Lincoln was 25% of normal!!

Looking at the charts, could we have made a better evaluation of what to expect during the 1988 fire season as early as June, 1988, knowing that "normal" is to dry out through July and August?

2. *Thousand-Hour Fuel Moisture and Energy Release Component*

The Energy Release Component is an estimate of potential available energy released per unit in the flaming zone of the fire. It reacts somewhat like the old BUI in that it doesn't vary day by day with the wind, but reacts to the moisture content of the various fuel classes, including the 1,000-hour timelag class. (See Figure 3) It is the primary fire behavior component of the wilderness fire prescription. As a component of the National Fire Danger Rating System, it is used for long-range planning rather than short-term fire behavior projections.

The ERC is a composite index and wind is not considered in the calculation, however, it is an important guide to fire behavior. As the ERC increases, so will the difficulty of containment.

In 1988, the ERC started above average and generally stayed above average at the Gleason and Lincoln Fire Weather Station. High ERC's were also recorded at Lincoln, Condon, and Spotted Bear during the summer. These four Fire Weather Stations drive the fire prescriptions for the Bob Marshall Complex. (See Figure 4) Thousand-hour fuels were correspondingly at an all-time low during the summer.

Here again, could we have made better projections utilizing this information?, i.e., if the ERC starts above average in late June, can we expect it to climb through July and August until Fall rains come in late August through mid-September?

We know that generally the ERC starts at some point, usually drops with June rains, then climbs through July and August, drops with the Fall moisture in late August through mid-September, then climbs as Indian Summer arrives. However, this pattern is not clearly evident when comparing the ERC graphs back to 1983. (The ERC for these years is graphed from daily readings taken once a week to give a general trend. The average is based on a 3-day running mean.) In 1987 the ERC generally started high, but fell off rapidly in July and never recovered to an appreciable extent. (See Figure 5.) In 1986 the ERC started low, made its summer climb, but never reached troublesome levels. (See Figure 6.) In 1985 the ERC started above average, made a spectacular climb in June and July, then plummeted with the unusual rains in early August. (See Figure 7.) The Charlotte Peak Wilderness Prescribed Fire occurred during this period and burned a total of 5,185 acres. In 1984 it is difficult to determine any kind of correlation among the four stations. 1984 was a serious fire year with many large wildfires through August; however, heavy rains occurred over most of the area in late August. (See Figure 8.) The Scarlet Peak Wilderness Prescribed Fire occurred in 1984 burning a total of 35 acres. 1983 generally started low and stayed low, (See Figure 9.) as did 1981 and 1982. The Cigarette Creek Wilderness Prescribed Fire occurred in 1981 and burned a total of 230 acres.

Previous to 1988, the Cigarette Creek, Scarlet Peak & Charlotte Peak fires were the only significant prescribed fires in the Bob Marshall Complex. The Gates Park Fire made its first major move to the east into and through Fuel Model 8 on July 21st. The ERC at Gleason, the governing Fire Weather Station for this fire, reached 42 on July 20th and 47 on July 21st. The 90th percentile for Gleason is 41, based on a 12-year average from 1973 to 1984. The ERC remained above the 90th percentile until September 10th.

During the development of the Fire Management Plan, it was found that most large fires occurred when the ERC reached the 80th percentile range. However, very seldom did Fuel Model 8 become an active fuel component. It seemed that Fuel Model 8 actually served as a fuel break in that severe burning, including crown fires, would burn into Fuel Model 8 and, due to a lack of surface fuel to sustain the crown fire, would drop to the ground and either go out at night, or at worst, exhibit very slow, insignificant spread. Without the heavier ground fuels and ladder fuels, fires in Fuel Model 8

could not make major runs. However, we had not experienced sustained periods of ERC's above the 90th percentile in this area since the 1978 National Fire Danger Rating System was started. Based on observed fire behavior in 1988, it would appear that Fuel Model 8 becomes an active player in the fuel complex when the ERC reaches the 90th percentile. Fire spread actively through the classic Fuel Model 8 from July 21st when the ERC reached the 90th percentile, until September 10th. To further complicate the projections, much of the fuels mapped as Fuel Model 8 were actually a transition between Fuel Models 8 and 10, with considerable sub-alpine fir coming in beneath the Lodgepole overstory, even though there was not a lot of down and dead in most cases.

3&4 *Climatology and Fire History*

A visit with meteorologists in Missoula and Great Falls indicates that the "norm" is to dry out rapidly from the first to mid-July, through August, with only small amounts of precipitation until late August through mid-September.

Couple this information with the history of fire in the area, and we begin to have all the pieces necessary to make better long-range projections. All large fires in the past made major runs to the east, many times seemingly independent of fuels, and at times, topography. Apparently the amount and kind of fuels had little effect on the fire's spread. This is quite evident looking at the map for fires between 1889 and 1929. (See Figure 10.)

DISCUSSION

It would appear that if Fire Behavior Analysts were to keep records, or have access to records of pre-season indicators such as snowpack, over-winter precipitation percent of normal, thousand-hour fuel levels, Energy Release Components compared to averages, local climatology, and local fire history, they would be able to make better long-range projections, and have a better idea of expected fire behavior and the kind of fire season to be expected.

The FBA is required to make two projections:

1. Size and shape under present and foreseeable conditions; and

2. Maximum size and shape under serious conditions.

In light of the pre-season indicators in 1988, and what the fire actually did, we can draw some conclusions. First, the pre-season indicators:

1. Snowpack: below average for several winters, including the winter of 1987-88.

2. Precipitation percent of normal: the accumulative percent of normal for the recording stations nearest the Gates Park Fire as of June 1, 1988, were generally between 50 and 60% of normal.

3. Energy Release Component: After recovering from the small amount of spring moisture received in May and early June, this component in the National Fire Danger Rating System was considerably above average by mid-July at the Gleason Fire Weather Station, the governing station for the Gates Park Prescribed Fire.

4. Climatology: the "norm" is to dry out rapidly from the first to mid-July, with only small amounts of precipitation until late August through mid-September.

5. Fire History: historically, large fires have made their major runs to the east.

This would seem to set the stage for the maximum size and shape under serious conditions. As stated, our short-term projections are pretty good, and we can project the fire's spread as it expands and moves into position under typical diurnal conditions, moving upslope with the wind, and backing into position. Consider now that we have reached the 90th percentile and Fuel Model 8 will be an active part of the fuel complex; then overlay this with the typical strong west-southwest wind influence that accompanies our summer disturbances on the heels of each high pressure system, and you have the tools to project the fire under serious conditions.

About the only missing ingredient is the number of disturbances we can expect in a given summer. In 1988 we experienced at least nine on the Gates Park Fire from July 11th through September 10th. The fire had moved into position to make major easterly runs for at least five of these frontal passages. For gaming purposes, and without better information, possibly five such disturbances could be used to game a free-burning fire through the course of a summer in order to estimate the fire's final size and shape under serious conditions.

The size and shape under present and foreseeable conditions can then be estimated similarly, depending upon how near the ERC is to the 90th percentile, as well as the status of other pre-season indicators. These factors related to the ERC in relation to the 90th percentile should indicate the extent to which Fuel Model 8 can be expected to burn.

Looking at the Gleason ERC graphs, three out of the six years since 1983 started hot and dry as indicated by the ERC levels above average, then dropped to below average during mid-summer. These were the years 1984, 1985 and 1987. One year, 1983, started low and stayed low. 1986 started low, then rose to dangerous levels in August, however, it did not climb above the 90th percentile to any extent. Of course, 1988 started high and stayed high. One cannot draw any hard and fast conclusions from five years of record, but, I believe it does give enough information to help us make the projections of size and shape under present and foreseeable conditions, particularly when coupled with experience of the past, i.e., years like 1988 do not occur very often, thank goodness!! Therefore, the size and shape under present and foreseeable conditions can be made assuming that there will be a drop in burning conditions some time during the summer months, and our rules-of-thumb will apply -- like, (a) humidity will rise at night, slowing fire spread; (b) Fuel Model 8 will retard fire spread; (c) fires will burn slow downhill; (d) shorter days in late August will limit fire spread, etc.

This evaluation of pre-season indicators should also allow an FBA to better estimate expected fire behavior and what kind of a fire season to expect. That will enable Management to make more informed decisions and specialists to provide a better estimate of the fire's impact on their respective resources.

My feeling is that it would be best to over-estimate, rather than under-estimate. I can live with weather conditions that change to reduce the final size from that projected, but to drastically under-estimate, like we did in 1988, can only lead to problems of credibility with Management as well as the general public.

ACCUMULATIVE PRECIPITATION
Percent of Normal
November through October

	Helena							Augusta							Great Falls					
	83 84	84 85	85 86	86 87	87 88	88 89		83 84	84 85	85 86	86 87	87 88	88 89		83 84	84 85	85 86	86 87	87 88	88 89
Nov	48	87	156	100	22	128	%	64	5	159	139	27	61	%	173	66	157	61	41	41
Dec	89	77	104	81	47	89		77	92	114	104	30	84		129	113	106	47	35	82
Jan	66	58	84	51	45			75	74	95	73	45			106	82	87	30	51	
Feb	60	63	121	42	58			65	78	130	82	66			103	70	90	31	54	
March	62	59	109	73	60			67	82	111	123	65			111	78	72	67	52	
April	85	57	103	71	78			97	87	89	95	62			101	66	97	63	52	
May	77	53	91	84	75			80	73	77	103	60			81	83	90	69	50	
June	84	40	80	83	82			82	58	68	87	55			81	69	79	70	54	
July	74	40	91	104	77			71	51	70	101	55			76	71	90	86	64	
Aug	77	58	89	96	68			80	81	73	114	51			75	96	84	96	59	
Sep	78	74	115	95	82			87	105	108	105	60			75	112	93	97	71	
Oct	80	76	108	90	84			89	112	115	100	63			78	113	93	92	72	

	Choteau							Lincoln							Seeley Lake					
	83 84	84 85	85 86	86 87	87 88	88 89		83 84	84 85	85 86	86 87	87 88	88 89		83 84	84 85	85 86	86 87	87 88	88 89
Nov	74	0	126	59	2	31	%	95	?	?	110	30	116	%	107	122	113	?	30	158
Dec	57	68	92	58	10	57		89	(105)	(66)	57	59	85		99	101	61	(86)	35	104
Jan	55	52	73	(60)	36			80	(72)	(64)	43	59			77	67	75	(89)	42	
Feb	43	45	90	(54)	41			70	(76)	(94)	48	82			(81)	66	97	(72)	62	
March	36	52	80	(84)	36			78	(68)	(87)	54	88			(76)	59	87		(82)	65
April	50	62	76	(61)	39			95	(71)	(77)	50	84			(82)	62	81	(77)	62	
May	40	67	59	(86)	50			98	(72)	(76)	54	90			(88)		67	82	(77)	73
June	48	51	66	(75)	50			101	(62)	(76)	55	87			(93)		64	83	(78)	72
July	45	43	63	(105)	54			99	(58)	(83)	71	85			(91)		61	84	(83)	69
Aug	45	78	70	(107)	51			105	(77)	(81)	73	82			(92)	72	88	(84)	68	
Sep	50	110	93	(100)	57			107	(94)	(86)	69	86			(95)	96	94	(78)	67	
Oct	54	112	95	(96)	56			109	(96)	(82)	66	92			?	?	91	(72)	77	

Fig. 3

1978 NATIONAL FIRE-DANGER RATING SYSTEM

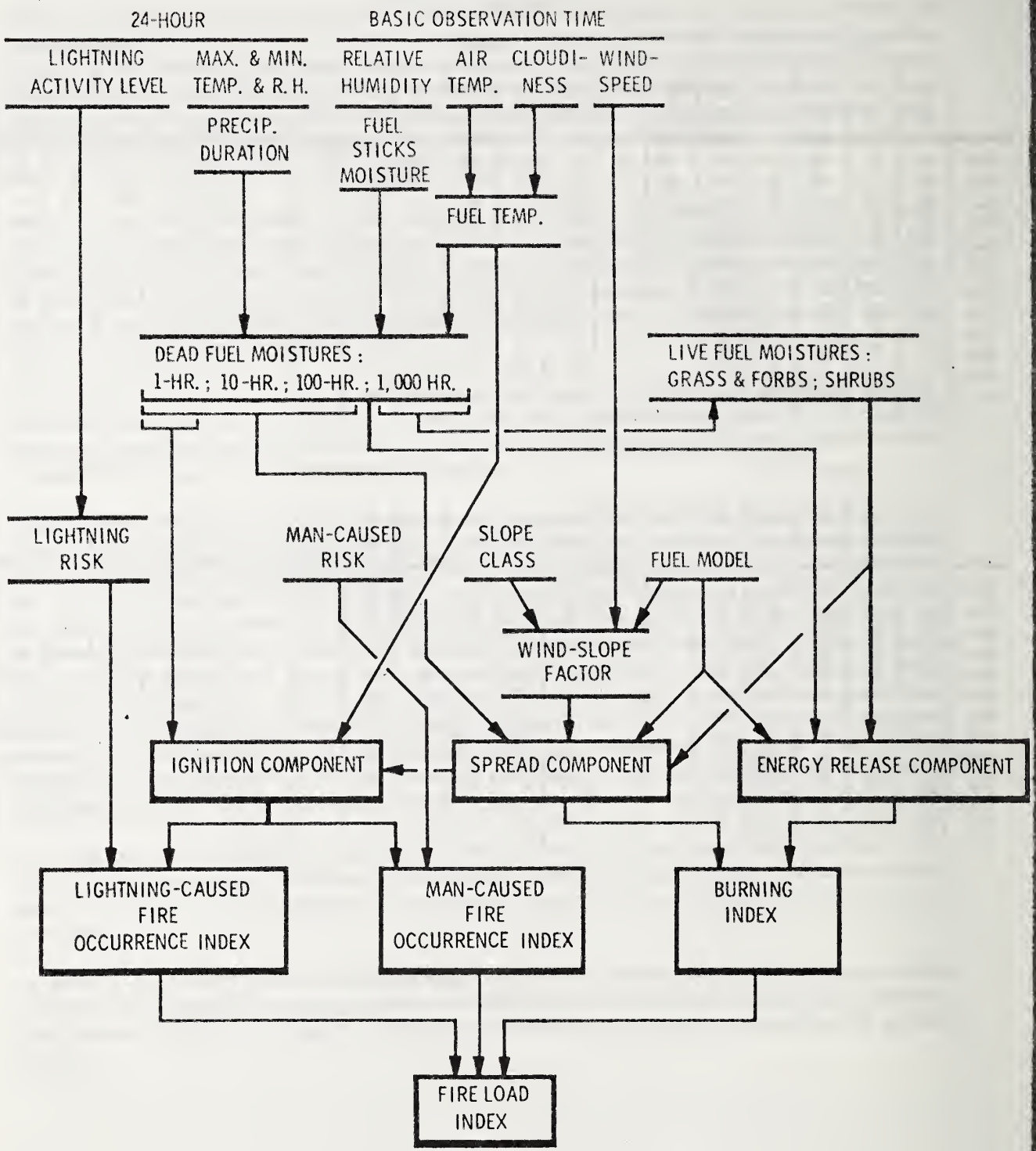


Figure 2.--Structure of the 1978 National Fire-Danger Rating System.

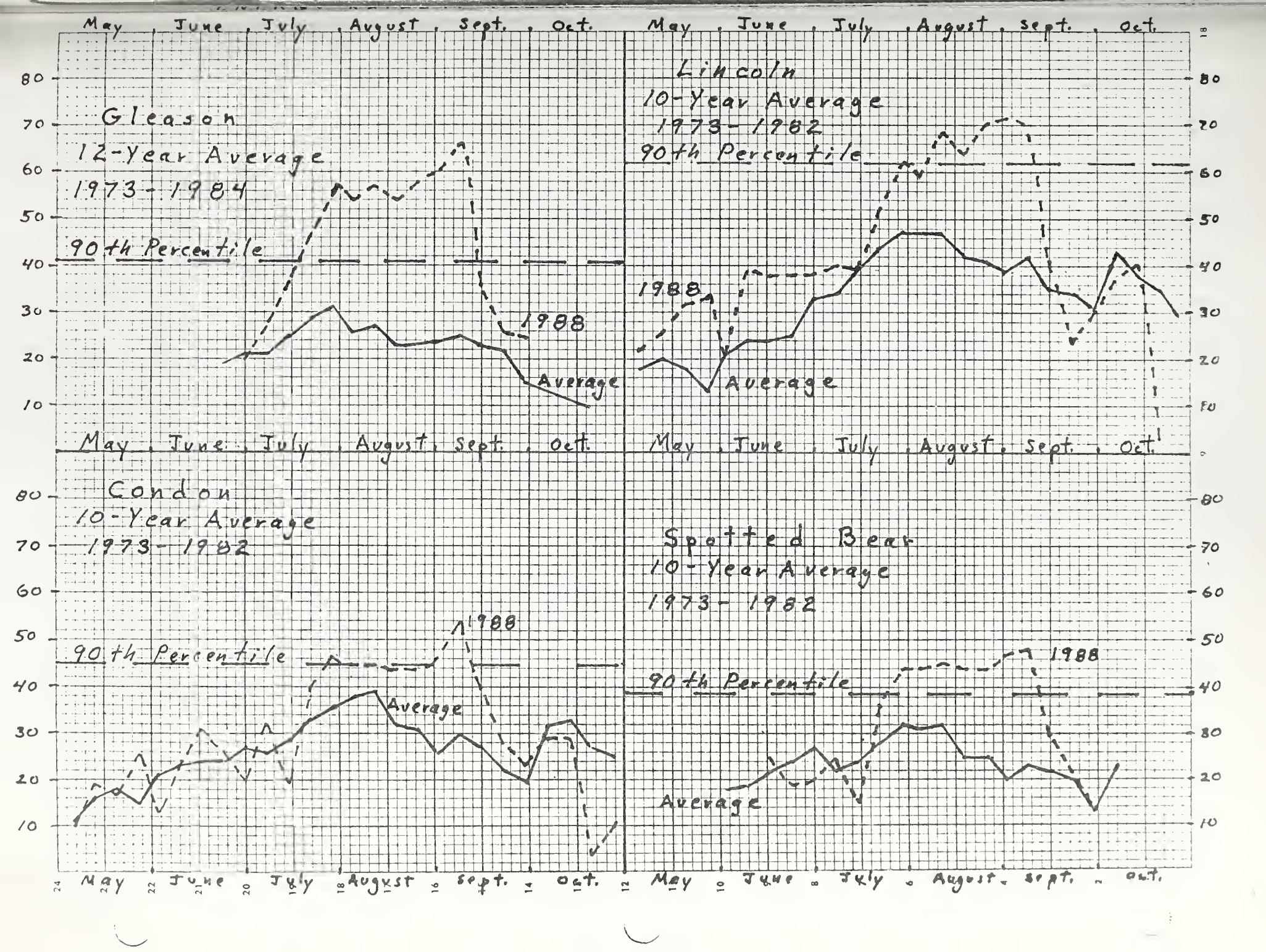
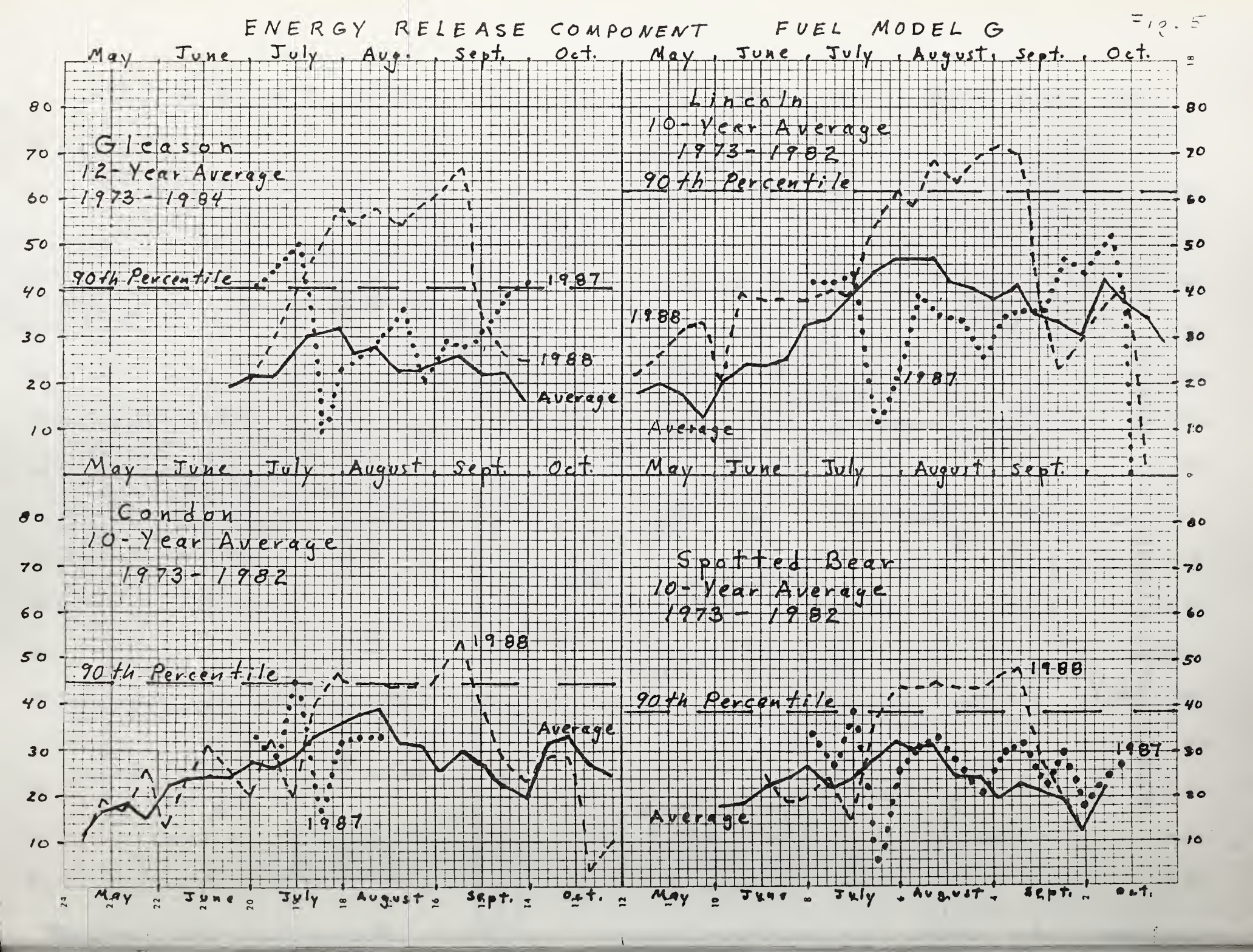
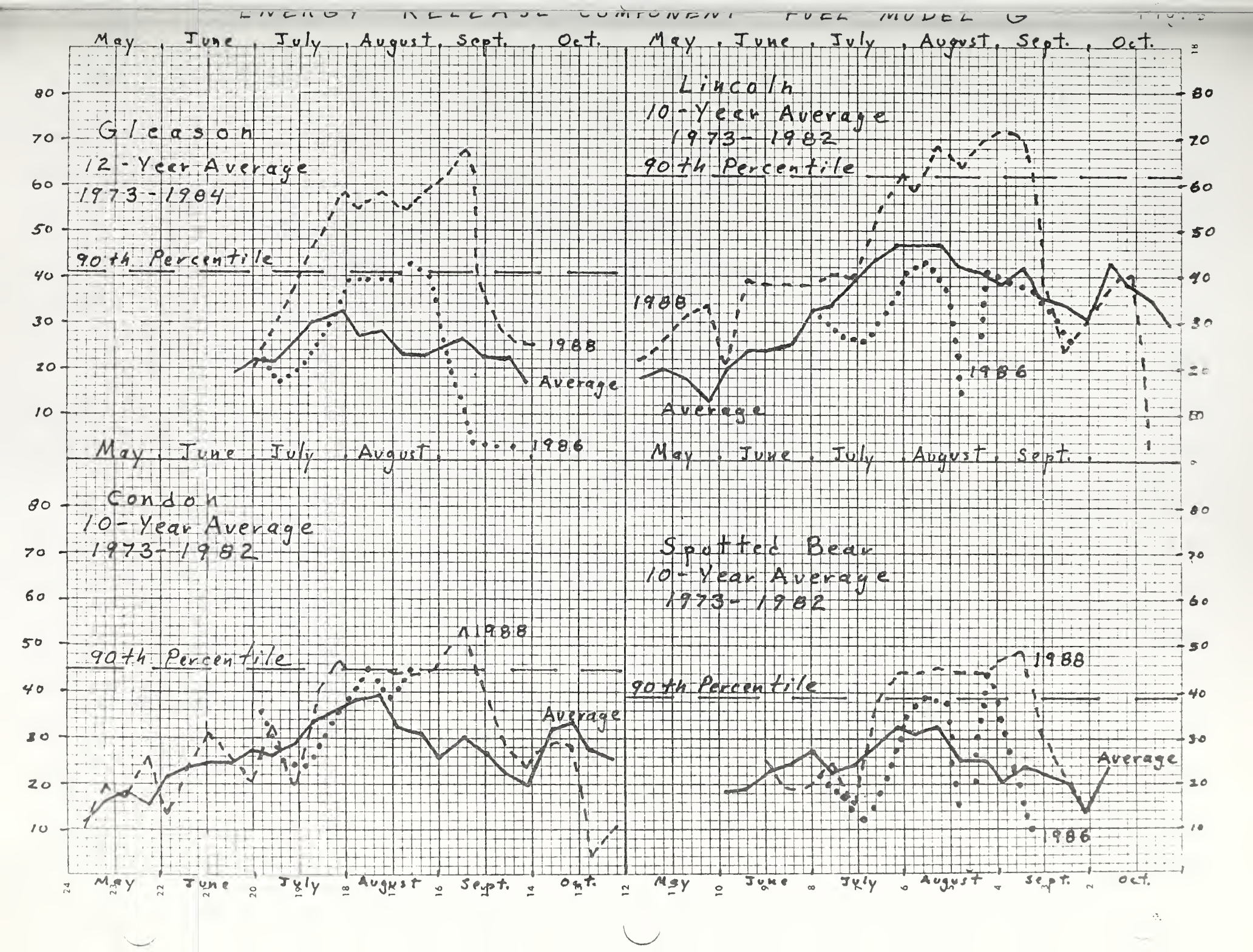

Gleason
12-Year Average
1973 - 1984
90th Percentile
1988
Average
May
June
July
August
Sept.
Oct.
Lincoln
10-Year Average
1973 - 1982
90th Percentile
1988
Average
Condon
10-Year Average
1973 - 1982
90th Percentile
1988
Average
Spotted Bear
10-Year Average
1973 - 1982
90th Percentile
1988
Average

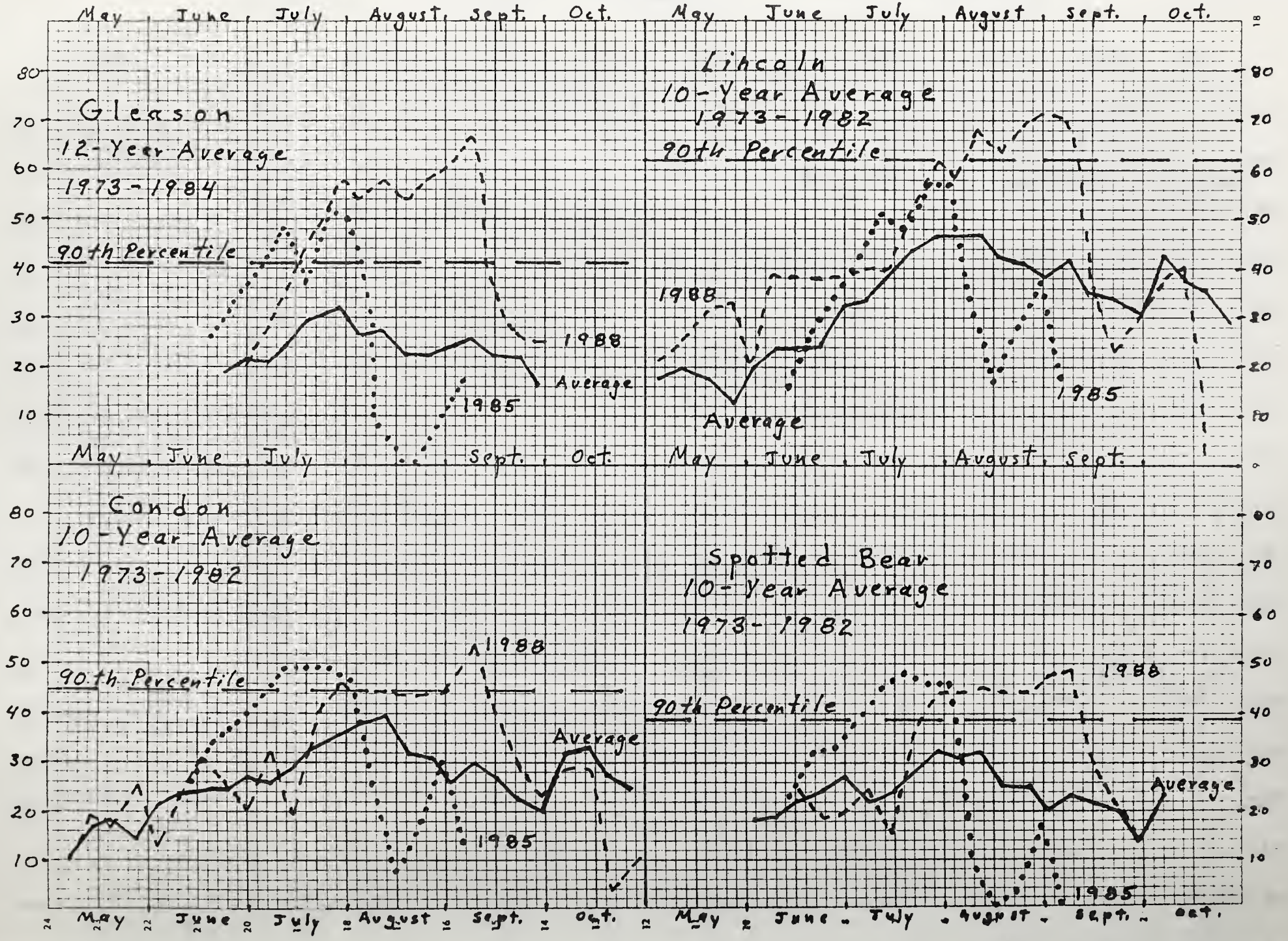
Fig. 5

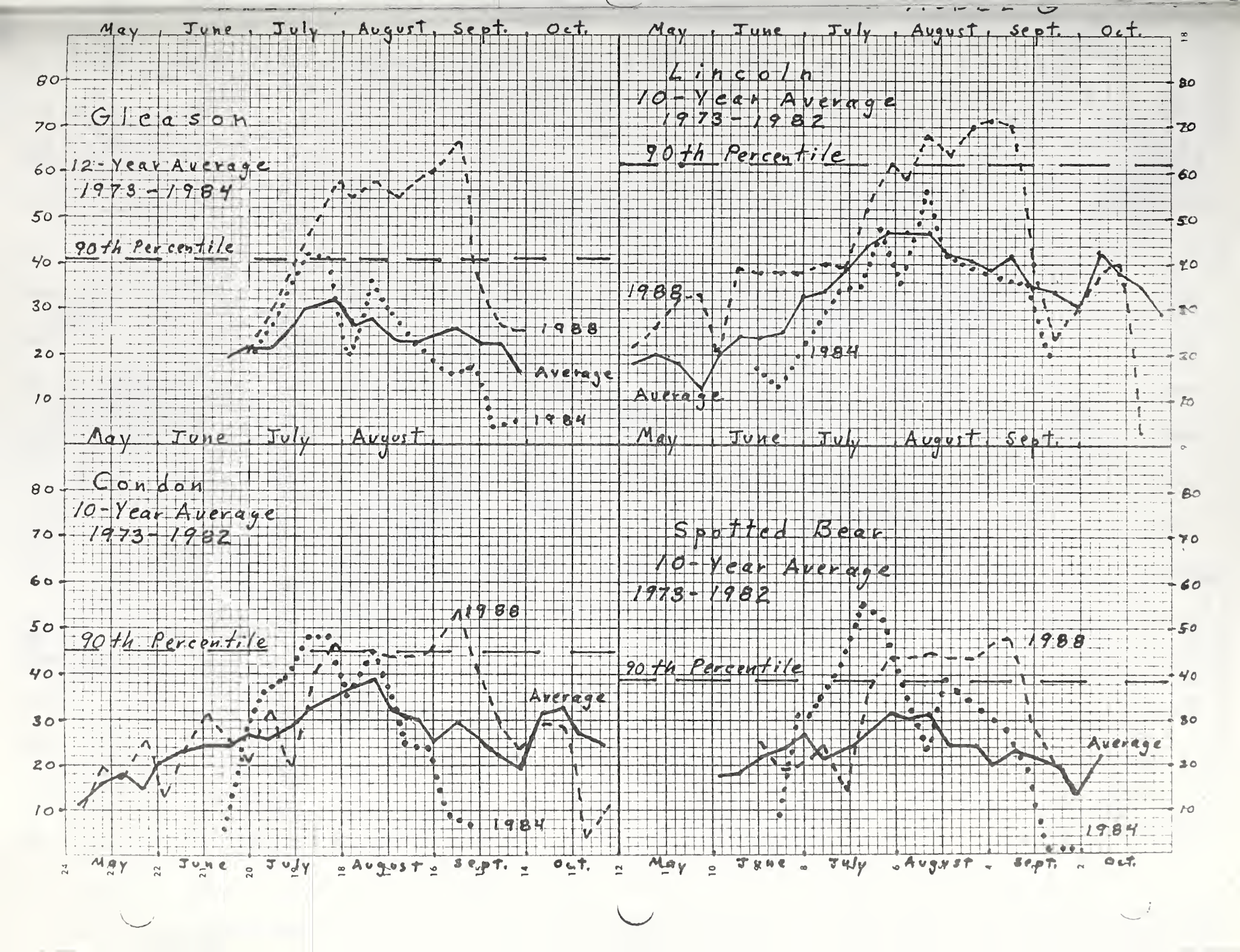
ENERGY RELEASE COMPONENT FUEL MODEL G




ENERGY RELEASE COMPONENT FUEL MODEL G
Gleason
12-Year Average
1973-1984
90th Percentile
1988
Average
1986
Lincoln
10-Year Average
1973-1982
90th Percentile
1988
Average
1986
Condon
10-Year Average
1973-1982
90th Percentile
1988
Average
Spotted Bear
10-Year Average
1973-1982
90th Percentile
1988
Average
1986
May
June
July
August
Sept.
Oct.

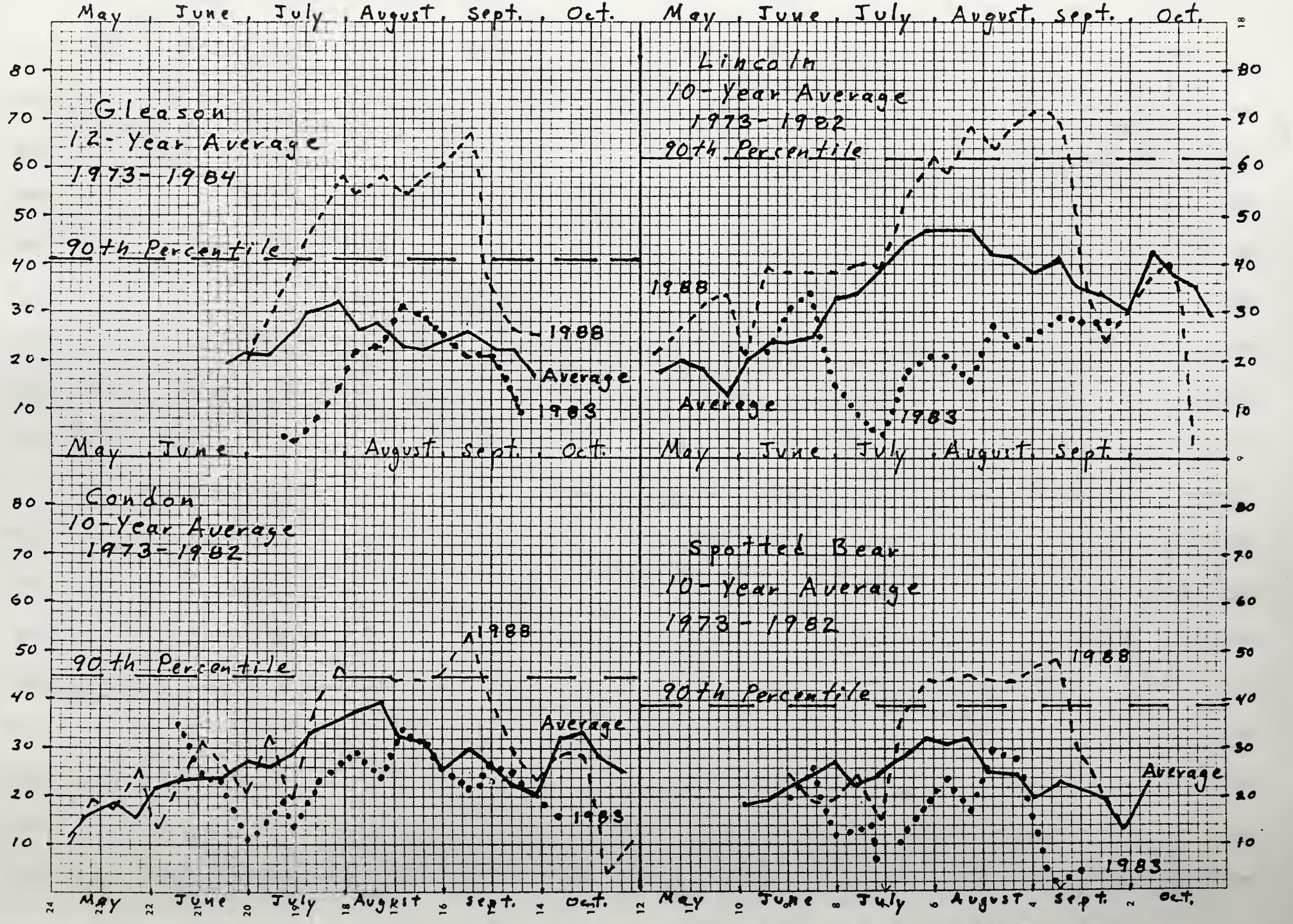
ENERGY RELEASE COMPONENT FUEL MODEL G

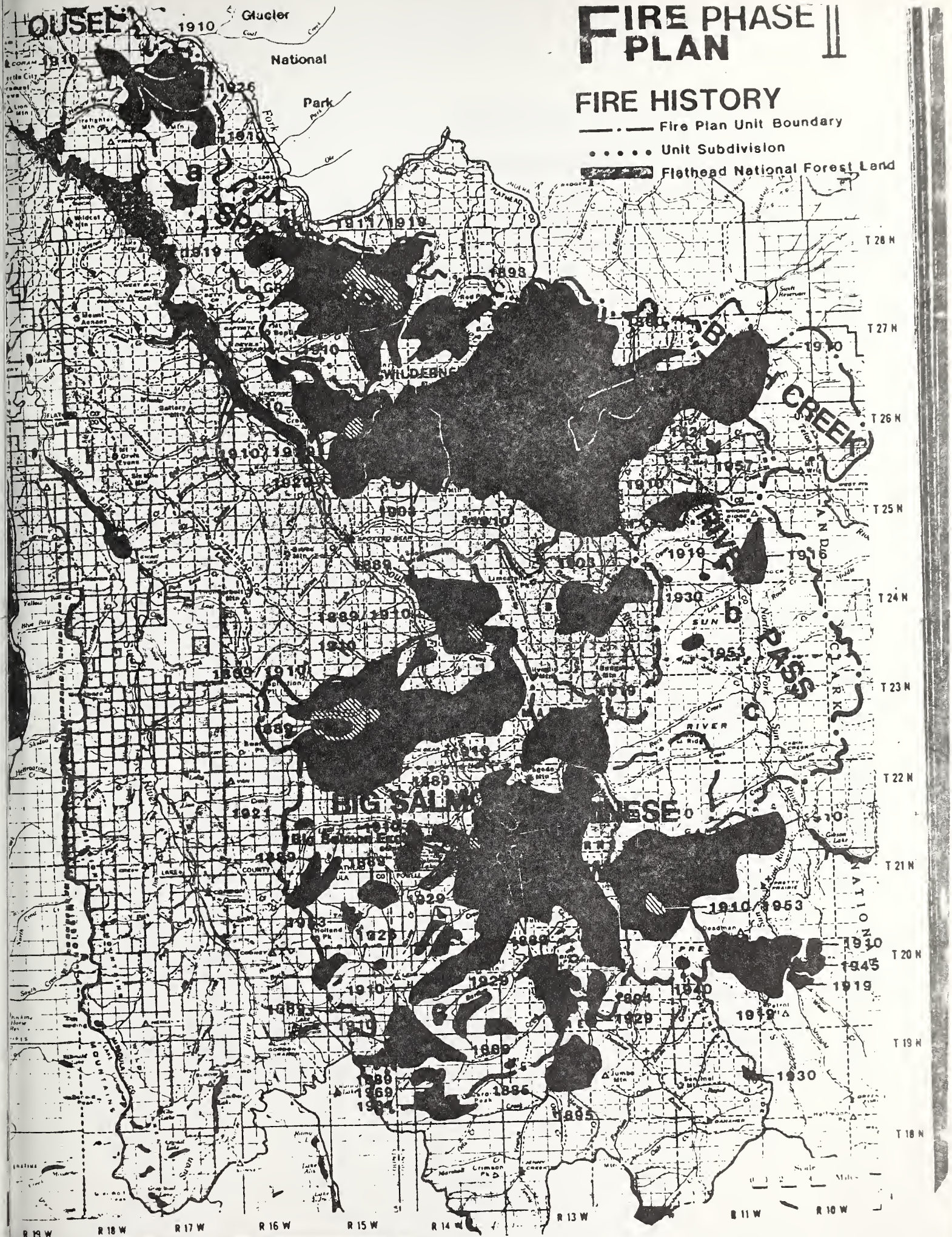



Gleason
12-Year Average
1973-1984
90th Percentile
1988
Average
1984
May
June
July
August
Lincoln
10-Year Average
1973-1982
90th Percentile
1988
1984
Average
Sept.
Condon
10-Year Average
1973-1982
90th Percentile
1988
Average
1984
Spotted Bear
10-Year Average
1973-1982
90th Percentile
1988
Average
1984
Oct.

ENERGY RELEASE COMPONENT FUEL MODEL G

Fig. 9




FIRE PHASE PLAN II
FIRE HISTORY
Fire Plan Unit Boundary
Unit Subdivision
Flathead National Forest Land
OUSEL
Glacier
National
Park
WILDERNESS
BIG SALMON
BIG SALMON
BOB MARSHALL
WILDERNESS
CLARK FORK
RIVER
T 28 N
T 27 N
T 26 N
T 25 N
T 24 N
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
T 18 N
R 19 W
R 18 W
R 17 W
R 16 W
R 15 W
R 14 W
R 13 W
R 11 W
R 10 W

APPENDIX D

BEARTOP WEATHER DATA

DATE	TIME	DRY BULB	WET BULB	R/H	DRTN	WIND SPEED	GUSTS	REMARKS	PRCP
7/12	1400	53°	44°	52%	SW	5-10	20	75% cld cvr	~
7/13	1355	45°	42°	81%	S/SW	7-12	20	trace prcp 90% cld cv	0.00
7/14	1400	47°	43°	75%	W	3-5		50% cld cv	0.02
~	1645	46°	41°	69%	NW	5-10		50% cld cv	~
7/15	1405	54°	40°	31%	SW	10		50% cld cv	~
7/16	1430	61°	46°	34%	W	3-5		25% cld cv	~
7/17	1445	56°	42°	33%	W/SW	5-7		25% cld cv	~
7/18	1530	~°	~°	~	~	calm		75% cld cv	~
7/19	1400	54°	44°	48%	~	calm		60% cld cv	0.00
7/20	1430	68°	48°	24%	SW	10-15		clear	~
7/21	1400	72°	51°	25%	SW	5-10		clear	~
7/22	1405	71°	49°	21%	W	6-9		clear	~
7/23	1515	69°	52°	34%	SW	2-7		20% cld cv	~
7/24	1400	68°	49°	27%	W	3-7		clear	~
7/25	1410	72°	50°	22%	W	0-2		30% cld cv	~
7/26	1435	73°	51°	23%	W/NW	3-7		clear	~
	1515	74°	52°	24%	~	~		~	~
7/27	1420	71°	52°	30%	W/SW	20	25	40% cld cv	~
7/28	1435	64°	46°	26%	SW	20	30	40% cld cv	~
7/29	1400	67°	48°	26%	SW	5-7		clear	~
7/30	1400	69°	50°	28%	W	10-15		clear	~
Bear	Top	Look	out		closed	7/31	to 8/2		
8/03	1415	56°	42°	33%	NE	0-2	~	20% cld cv	0.01
8/04	1030	55°	45°	49%	SW	0-5	~	clear	~
~	1415	67°	49°	29%	W	0-5	~	~	~
8/05	1405	72°	49°	19%	SW	5-10	~	20% cld cv	~
8/06	1420	49°	41°	54%	W	20	35	70% cld cv	0.04
8/07	1125	45°	39°	62%	~	calm	~	80% cld cv	~
8/08	1413	60°	46°	37%	SW	5-8	~	10% cld cv	~
~	1650	62°	45°	28%	~	~	~	~	~
8/09	1400	61°	48°	42%	W	4-8	~	20% cld cv	~
8/10	1400	63°	46°	29%	W	5-8	~	40% cld cv	~
8/11	1400	69°	51°	31%	W	8-12	~	30% cld cv	~
8/12	1355	69°	54°	41%	S	3-8	10	10% cld cv	~
8/13	0910	54°	46°	58%	NE	5-8	~	10% cld cv	0.23
~	1400	59°	48°	48%	~	calm	~	50% cld cv	0.24
8/14	1420	57°	45°	42%	W/SW	10-15	~	50% cld cv	0.08
8/15	1400	60°	46°	37%	NE	5-10	15	5% cld cv	~
8/16	1400	60°	48°	45%	W	2-8	~	30% cld cv	0.11
8/17	1400	65°	49°	34%	S	5-10	~	50% cld cv	~

DATE	TIME	DRY BULB	WET BULB	R/H	DRTN	WIND SPEED	GUSTS	REMARKS	PRCP
8/18	1400	62°	47°	35%	SW	5-12	~	20% cld cv	~
8/19	1445	63°	42°	15%	SW	3-7	10	clear	~
8/20	0810	4 °	37°	56%	SW	3-7	10	30% cld cv	~
~	1355	52°	39°	33%	SW	5-15	20	40% cld cv	~
8/21	1510	49°	39°	44%	W	2-5	10	20% cld cv	~
8/22	1305	55°	41°	32%	W	5-10	15	clear	~
8/23	0720	46°	38°	52%	E	0-3	~	clear	~
~	1000	49°	41°	54%	E/NE	calm	5	clear	~
~	1400	63°	45°	25%	W	3-9	~	clear	~
~	1600	65°	45°	21%	W	3-7	10	clear	~
8/24	0845	55°	42°	36%	E/NE	3-10	~	clear	~
~	1405	67°	47°	23%	SW	0-5	10	??% cld cv	~
~	1740	63°	47°	32%	~	~	~	~	~
8/25	0800	57°	43°	34%	SE	10-15	~	100%cld cv	0.00
~	1400	69°	49°	25%	SW	3-6	10	50% cld cv	~
8/26	0800	48°	39°	48%	NE	0-5	~	95% cld cv	0.00
~	1405	40°	39°	93%	E	2-9	12	100% -Rain	0.11
8/27	0815	43°	37°	61%	~	calm	~	clear	0.00
~	1400	53°	44°	52%	E-SW	0-5	9	60% cld cv	0.00
8/28	1315	62°	45°	28%	SW	0-5	9	clear	~
8/29	1200	60°	44°	29%	SW	6-9	12	clear	~
~	1400	67°	46°	20%	SW	10-15	20	clear	~
8/30	0800	46°	37°	46%	NW	0-7	12	clear	~
~	1500	59°	41°	21%	W	0-7	10	clear	~
8/31	0800	42°	35°	54%	N-E	0-3	5	clear	~
~	1400	56°	40°	25%	E-S-W	0-3	7	clear	~
9/01	0800	48°	36°	32%	~	calm	~	clear	~
~	1400	61°	41°	16%	E+-90	0-3	8	clear	~
9/02	0800	56°	40°	25%	SE	9-13	~ %	clear	~
~	1415	68°	47°	21%	SW	4-8	~ %	clear	~
9/03	0800	54°	40°	48%	E	8-10	15 %	clear	~
~	1400	62°	48°	39%	S+-90	0-4	9 %	clear	~
9/04	0830	57°	42°	30%	SW	5	~ %	clear	~
~	1400	69°	49°	25%	SW	0-3	5 %	clear	~
9/5	1515	67°	46°	20%	W	3-6	10 %	10% cld cv	~
9/06	1410	64°	44°	20%	W/SW	15-20	35 %	10% cld cv	~
~	1845	59°	39°	14%	W	30-40	50 %	clear?	~
~	1955	57°	39°	18%	W	20-25	45 %	~	~
~	2105	54°	38°	22%	W	25-30	40 %	~	~
~	2155	52°	38°	28%	W	20-25	40 %	~	~
~	2255	51°	39°	36%	W	25-30	35 %	~	~
~	2355	50°	39°	40%	W	15-20	30 %	~	~
9/07	0055	48°	39°	48%	NW	15-20	35 %	~	~
~	0805	39°	33°	57%	NW	10-15	20 %	50% cld cv	~
~	1135	41°	33°	47%	W	10-15	25 %	60% cld cv	~
~	1400	45°	35°	40%	W	8-12	20 %	30% cld cv	~
~	1945	41°	33°	47%	W	20-25	35 %	80% cld cv	~

DATE	TIME	DRY BULB	WET BULB	R/H	DRTN	WIND SPEED	GUSTS	REMARKS	PRCP
9/08	0800	33°	29°	??	NW	8-12	18	clear	~
~	0900	35°	30°	60%	NE	2-5	~ %	clear	~
~	1000	36°	30°	54%	W	3-8	15 %	clear	~
~	1100	40°	32°	45%	W	3-8	10 %	clear	~
~	1200	44°	34°	39%	W	5-8	14 %	clear	~
~	1300	49°	36°	29%	W	3-8	16 %	clear	~
~	1400	53°	38°	25%	W/SW	8-12	~ %	clear	~
~	1500	52°	38°	28%	W	2-7	~ %	5% cld cv	~
~	1600	52°	38°	28%	W/SW	8-12	23 %	clear	~
~	1700	52°	39°	33%	W	10-15	23 %	10% cld cv	~
~	1800	52°	39°	33%	W	10-15	23 %	5% cld cv	~
~	1900	50°	39°	40%	W	5-10	18 %	clear	~
~	2000	47°	37°	42%	W	10-15	~ %	10% cld cv	~
9/09	0800	42°	36°	60%	SW	5-10	15 %	5% cld cv	~
~	0900	43°	37°	61%	SW	5-10	15 %	10% cld cv	~
~	1000	45°	38°	57%	SW	5-10	~ %	5% cld cv	~
~	1100	48°	39°	48%	SW	2-7	10 %	10% cld cv	~
~	1200	51°	41°	46%	SW	2-7	10 %	25% cld cv	~
~	1300	55°	43°	40%	W	2-7	10 %	35% cld cv	~
~	1400	58°	43°	31%	W	15-20	35 %	65% cld cv	~
~	1500	57°	43°	34%	W	20-25	40 %	90% cld cv	~
~	1600	58°	43°	31%	W	10-15	20 %	80% cld cv	~
~	1700	56°	42°	33%	W	6-12	18 %	30% cld cv	~
~	1800	55°	41°	32%	W	5-10	15 %	35% cld cv	~
~	1910	54°	41°	35%	W	10-15	~ %	20% cld cv	~
~	2000	50°	39°	40%	W	2-7	~ %	10% cld cv	~
9/10	0800	40°	33°	52%	NE	2-7	~ %	100%cld cv	~
~	0900	40°	33°	52%	NE	3-8	12 %	lt snow	~
~	1000	40°	33°	52%	N	0-4	~ %	fog	~
~	1100	36°	34°	84%	N	4-8	12 %	snow	~
~	1200	33°	33°	100%	E/NE	4-8	12 %	lt snow	~
~	1300	34°	32°	84%	N/NE	0-4	~ %	lt snow	~
~	1405	33°	32°	92%	NE	4-8	12 %	lt snow	0.02
~	1500	29°	?	?	E	4-8	12	lt snow	~
~	1605	28°	?	?	E	5-10	20	snow	~
Beartop		closed	to 9/13						
9/13	1305	48°	42°	65%	SE	5-10	15 %	10% cld cv	~
~	1400	47°	39°	53%	SE	3-7	12 %	10% cld cv	0.45
~	1505	47°	39°	53%	E/SE	3-7	12 %	10% cld cv	~
~	1600	48°	40°	54%	E-S-W	0-3	~ %	5% cld cv	~
9/14	0755	43°	37°	61%	N	3-7	~ %	clear	~
~	1000	47°	39°	53%	NE	4-7	9 %	clear	~
~	1200	50°	41°	50%	~	calm	~ %	clear	~
~	1400	56°	45°	46%	E	0-3	~ %	clear	~

DATE	TIME	DRY BULB	WET BULB	R/H	DRTN	WIND SPEED	GUSTS	REMARKS	PRCP
9/15	0800	45°	38°	57%	NW	8-12	~ %	clear	~
~	1000	48°	39°	48%	N	2-6	~ %	clear	~
~	1200	56°	42°	33%	NW	0-5	10 %	clear	~
~	1405	62°	45°	28%	W	3-8	12 %	clear	~
~	1555	57°	42°	30%	W/SW	12-16	28 %	hazy	~
~	1655	57°	42°	30%	W	3-9	12	5% cld cv	~
9/16	0755	44°	36°	50%	W/SW	5-7	~	95% cld cv	~
~	1000	45°	37°	51%	W/SW	0-5	~	very hazy	~
~	1200	47°	39°	53%	W/SW	3-8	12	90% cld cv	~
~	1300	48°	39°	48%	W	0-3	~	80% cld cv	~
~	1400	50°	40°	45%	W	0-3	~	90% cld cv	0.00
~	1600	48°	39°	48%	W	0-5	8	75% cld cv	~
9/17	0800	29°	?	?	NE	0-3	~	heavy fog	~
~	1000	29°	?	?	E	10-14	~	fog/snow	~
~	1200	29°	~	~	~	calm	~	fog/lt snw	~
~	1400	29°	?	?	E	0-5	15	fog/snow	~
~	1600	27°	?	?	~	calm	~	heavy snow	~
9/18	0800	23°	?	?	NE	4-6	10	30% cld cv	~
~	1400	36°	?	?	SW	0-3	~	fog	0.59
~	1720	~	~	~	NW	0-5	~	85% cld cv	~
9/19	0805	28°	?	?	SW	8-12	16	90% cld cv	~
~	1000	29°	?	?	W/SW	8-12	15	snow	~
~	1200	30°	?	?	W/SW	8-12	15	modrt snow	~
~	1400	30°	?	?	W/SW	10-14	~	modrt snow	~
~	1600	32°	?	?	W/SW	5-10	~	lt snow	~
9/20	0850	29°	?	?	~	calm	~	35% cld cv	~
~	1000	31°	?	?	NE	2-5	~	fog	~
~	1200	31°	?	?	NE	0	3	fog/lt snw	~
~	1400	32°	?	?	SE	0	3	sleet	0.06
~	1600	33°	?	?	S-SW	3-6	10	40% cld cv	~
9/21	0745	28°	?	?	NW	0-5	10	10% cld cv	~
~	1000	28°	?	?	NW	3-8	14	clear	~
~	1200	34°	30°	67%	NW	3-8	~	5% cld cv	~
~	1400	40°	35°	65%	W	5-10	~	5% cld cv	0.00
~	1615	38°	34°	71%	W	5-8	15	20% cld cv	~
9/22	0800	28°	?	?	NW	2-5	~	40% cld cv	~

* Total from 1400, 9/16 to 1400, 9/18. Majority of precipitation came down as snow on 9/17.

NOTES: Wind direction: E/NE means east by northeast; E-S means winds shifting in range east to south.
Precipitation: ~ indicates none; 0.00 indicates trace; 24 hour total is given at or near 1400 hr, value at other hours is included in 1400 reading

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

AIR QUALITY BUREAU

TED SCHWINDEN, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

HELENA, MONTANA 59620

(406) 444-3454

November 1, 1988

Mr. Tim Love
Rocky Mountain Ranger District
P.O. Box 340
Choteau, MT 59422

Dear Mr. Love:

Thank you for your support of the air quality monitoring effort in response to the Gates Park and Canyon Creek fires. We appreciate the assistance we received from Danelle and Kelly. They did an excellent job operating the equipment.

Enclosed is a report on the monitoring effort for your information.

Sincerely,

Jeffrey T. Chaffee, P.E.
Chief

JTC:jm

Office Memorandum

STATE DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

JTC 10/
SS 10-
BR 10/
JG FILE
EN
forest fire 8

TO: Files

DATE: October 6, 1988

FROM: Jan Gilman jg

SUBJECT: Special Monitoring for the U.S. Forest Service in Response to Forest Fires

In response to a request from the U.S. Forest Service, the AQB established a PM-10 monitoring site in Lincoln and a TSP site in Choteau. The sites were established because these communities were impacted by smoke from forest fires in the Bob Marshall Wilderness. These fires were burning under a "let burn" policy and were expected to last for a long period of time. Complaints had been received from the communities and, to protect the public health, monitors were put in August 10, 1988.

The Lincoln monitor was located at the Aspen Grove Campground and the Choteau monitor at the High School. Forest Service personnel were trained as operators and were instructed to operate the monitors for a 24-hour period on days that were impacted by smoke. Therefore, samples were not collected midnight to midnight but for a 24-hour period from the beginning of a smoke episode.

The filters were mailed to the DHES where a weight and concentration were immediately determined and reported to the ranger station. The filters were then equilibrated and reweighed. The concentrations were usually identical. The results from this sampling are as follows:

USFS Episode Monitoring

24-Hour Samples

	Choteau (TSP Monitor)	Lincoln (PM-10 Monitor)
8/11	65 µg/m³	
8/12	55	
8/15	179	
8/16	45	9 µg/m³
8/17	107	
8/18	51	14
8/20	15	
8/25	99	28
8/27	28	12
8/28	114	
8/30	81	
9/4		23
9/5		47
9/6	373	
9/7	83	
9/11	98	

There were no concentrations in Lincoln that posed a health hazard. On August 15, Choteau had a reading of 179 $\mu g/m^3$ which was over the standard of 150 $\mu g/m^3$. However, the AQB felt it was due to blowing dust rather than smoke from the fires. On September 6, Choteau's reading of 373 $\mu g/m^3$ was high and the AQB issued health warnings for that day. The western part of the state experienced high concentrations of particulate from wood smoke at most sites over the Labor Day weekend.

The sites were removed September 30, 1988, after the fires were contained and no longer an air quality problem.

JG:kh

APPENDIX F

Contingency Plan

9/7/88

IF THERE IS PENDING THREAT TO WILDERNESS BOUNDARY

Notify All residents and land owners on the list at bottom of page of the possible threat.

Notify the Teton County Sheriff of situation and possible need for assistance.

Notify Great Falls Dispatch of Potential.

IF THERE IS IMMINENT THREAT TO WILDERNESS BOUNDARY.

Notify Teton County Sheriff. Ask them to contact portion of list most immediately threatened. Have them activate pre-planned defenses.

Teton County heavy equipment ready and loaded
Sprinkler system at Massey Creek cabins
Dozer at Teton Pass Ski Area
Move cattle at Hank Boumas
Call Bob Hamilton for heavy equipment

Notify all others on list to be prepared to evacuate.

Notify all on "casual" list for possible assistance. And including the Hutterite colony at Miller and New Rockport.

LIST OF PEOPLE TO CALL

Teton Sheriff (Gary & Frank) call every 2 hours, if necessary, starting ±1000 to ±2200 at 466-5781

Jim Boadle	562-3373
Don Passmore	466-2173
The Salmonds	466-2815\466-2000
Sophie Lane	466-2960
Wayne Gollehon	466-5610
Cindy & Dave McAllister	466-2377
Circle 8	466-2377
Blixrud	466-2044
Ski area (Jay Dunckel)	466-2305
The Klicks	467-2771
Weist's cabin (call Pete Howard)	466-2428
Andree Deligdisch	452-5554 hm 727-5572 wk
Bob Hamilton	278-3456
Marvin Thompson (have Bob Hamilton contact)	
Lyle Dyer	753-2359
Frank Kelly	466-2837
Hank Bouma	466-2140
Gibson Reservoir Area - See Sheriff list included	

APPENDIX E

TITLE 5100 - FIRE MANAGEMENT

EXHIBIT 1

Official Copy

*-

ESCAPED FIRE SITUATION ANALYSIS (Report Number FS-5100-Z)

EFSA NUMBER one of _____

REGION: One DATE: 9-7-88

FOREST: Lewis & Clark TIME: _____

I. FIRE SITUATION:

Fire Name: Gates Park Current Size: 50,400

Fuel: Heavy Timber Fire Behavior: Extreme

Narrative (attach description of the existing local and regional fire situation): Critical

II. FOLLOW UP:

* → The selected alternative shall be reviewed prior to each shift change ✓ to determine if it is still valid. If not, new EFSA will be developed.

1. Shift Review:

By: Stiger & Curtiss Date & Time: Daily, Cont. Eve

By: Stiger & Curtiss Date & Time: 9/13/88 *

By: Stiger, Kamrud & Peila Date & Time: 9/24/88 *

Decision to make a new EFSA.

By: _____ Date & Time: _____

2. Evaluation of Selected Alternative:

IMMEDIATELY AFTER THE FIRE IS CONTROLLED, THE ACTUAL FIRE SHOULD BE EVALUATED AGAINST WHAT WAS PLANNED AND APPROVED.

A. Final Size: _____* Estimated Suppression Costs $_____*

Net Resource Value Change $_____*

B. Evaluation Criteria Compliance: _____

Alternative Approved for Implementation:

[signature] Forest Supervisor 9/10/88

Signature Line Officer Title Date

_____ *

Time

*Must agree with Form FS 5100-29.

* See attached Supplement.

TITLE 5100 - FIRE MANAGEMENT

Exhibit 1--Continued

*-

III. EVALUATION CRITERIA:

For each category, develop the line officer's decisions on specific objectives, expressed as measureable criteria, to be used in the selection of the preferred alternatives.

Check those criteria which MUST be met.

CRITERIA	MUST	Priority
Economic: Since this is a successful Rx fire that must be suppressed due to critical fire weather and limited resources, every effort should be made to keep expenditures in line with prescribed fire objectives.		5.
Environmental: It is imperative that suppression activities lie easy on the land. The land should not suffer because of the necessity to declare this successful prescribed fire a wildfire, however control must be assured commensurate with the season of year and weather forecast	✓	3.
Social: There are numerous groups and individuals with interests immediately adjacent to the Wilderness. These interests are mapped and require the highest priority protection. This includes all interests, i.e. watershed, livestock, structures, etc.	✓	2.
Other: Firefighter Safety will be the highest priority objective.	✓	1.
Protection of FS structures		4.

Approved By: _____ Line Officer

-FSM 1/81 AMEND 62-

TITLE 5100 - FIRE MANAGEMENT

Exhibit 1--Continued

*-

IV. ALTERNATIVES (See instructions on back)

	Alternatives			
	A	B	C	D
General Plan of Control (Strategic)	Direct Attack With: Tactical team 2 crews 4 District Retardant Helicopter-water drops	Indirect Attack With: Tactical team 4 crews 10 District Retardant Helicopter-Water drops	Direct Attack With: Class II team 5 type I crews 5 type II crews Retardant Helicopter-waterdrops	Indirect Attack With: Class II Team 5 type I crews 5 type II crews Retardant Helicopter-water drops
Specific Plan of Control (Tactical)	See attached plans (Contingency plan is also included)			
Probability of Success %	85%	75%	95%	90%
Est. Control Time	November 1st, 1988			

-*

Exhibit 1--Continued

*-

INSTRUCTIONS

V. ALTERNATIVES

Develop alternative plans to control the fire. These will be the "results you expect to achieve." All alternatives may have the same general plan, but may have different specific plans. Or, there may be different general plans with similar specific plans.

A map MUST be prepared showing each alternative.

The map should be based upon the "Calculations of Probabilities" and include other relevant information.

A "no suppression" alternative is not acceptable.

An alternative which does not meet all "MUST" evaluation criteria is not acceptable.

TITLE 5100 - FIRE MANAGEMENT

Exhibit 1--Continued

VI. EFFECTS

	Alternatives A	B	C	D
1. Size (Predicted final size in acres)	57000	92000	55000	92000
2. Market elements:				
Timber	—	—	—	—
Improvements	90,000	150,000	90,000	150,000
Recreation	ø	ø	ø	ø
Wilderness	+	+	+	+
Wildlife	+	+	+	+
Fish	−	−	−	−
Water	ø *	−	ø *	−
Forage	N/A	N/A	N/A	N/A
	+	ø	+	ø
Sum of Net Value Change	$ 90,000	$ 150,000	$ 90,000	$ 150,000
3. Non-market elements: Air, Visual, Fuels, Threatened & Endang. Sp.	very little difference at this point between alternatives			
Sum of Net Value Change	$ ——	$ ——	$ ——	$ ——
4. Social elements:				
Firefighter Safety	+	+	−	+
Employment	+	+	+	+
Public Concern	−	−	+	+
Public Safety	+	−	+	−
Cultural	ø	ø	ø	ø
Other				
Sum of Net Value Change	$ +	$ ø	$ +	$ +
5. Suppression Costs	$ 750,000	$ 2,000,000	$ 6,000,000	$6,000,000
6. Cost plus net value change	+ $840,000	ø $3,150,000	+ $6,090,000	+ $6,150,000

INSTRUCTIONS

(1) Evaluate only the significant economic, environmental or social elements in this fire area. Only those economic, environmental and social effects which result from impact on planned or existing uses should be included as value changes.
(2) Enter dollar values if possible using the best available information when estimating net value change. Value change may be positive (+) or negative (-) but record only the net + or - value.
(3) If dollar values are not possible use + or - symbols, they may range from +++ to + for positive change and from --- to - for negative change.
(4) Cost plus net value change is calculated as the sum of net economic value change, the net environmental value change, plus net social value change, plus the suppression costs (suppression costs are always negative (-)).

* No loss or gain based on Hydrologist (FS) and Greenfield Irrigations estimate that 35,000 acres of stand replacement burn would have to occur before there would be a significant impact to Gibson Reservoir. Alternatives A and C are

TITLE 5100 - FIRE MANAGEMENT

Exhibit 1--Continued

VII. EVALUATION

Each alternative is evaluated against the same criteria developed in Section II. Review all pertinent data previously developed which relate to the criteria.

Criteria	Alternative A	B	C	D	MUST	Priority
Economic:	2	0	0	0		5.
Environmental:	1	1	0	0	✓	3.
Social:	1	1	2	1	✓	2.
Other:	2	1	~~X~~ 1	2	✓	1.
	2	0	2	0		4.

KEY
0 = Does not meet criteria
1 = Partially meets criteria
2 = Fully meets criteria

Exhibit 1--Continued

*-

VIII. SELECTED ALTERNATIVE

Selected Alternative: A

Explanation (document the rationale, criteria, value change, available resources, etc., for selection of this alternative):

Best meets the evaluation criteria based on current and forcasted weather in light of time of year.

Public information direction (for keeping public informed of situation) shall be developed as appropriate: See Contingency Plan.

-*

Alternative A

Gates Park Fire - Specific Plan of Control

Control - Alternative A

1. Continue to hold existing developed line on the South Fork. Mop up 4 chains in from perimeter to reduce threat of unburned areas affected by the threat of north winds. Direct attack with bucket isolated spot in head of Biggs Creek and any others that show up south of Grouse Creek.

2. Extend hand constructed line to the west, from where the existing line ties into Rock Creek, to the top of Goat Ridge. This line is required to reduce the threat of fire backing into the prevailing SW wind into Rock Creek on a wide or irregular front (± 5 miles).

3. Develop a continuous retardant line with MAFFS trail drops on the head of the fire from the north end of Wapiti Ridge west and north, across the head of the fire, through the mouth of Monroe Creek and west to the ridgeline north of the 7-up drainage.

4. Direct attack isolated spots on the east side of Wapiti Ridge by bucket operations and cool with water and retardant, the existing line from the mouth of Route Creek south to Frazier Creek will require periodic retardant and water to reduce intensities at the mouth of Route Creek. This area should not be manned until the ongoing threat of rapid crown fire is diminished, to the level that personnel can safely and effectively re-establish a control line, reinforced by ground water systems, in this area.

5. Periodic direct attack on strategic portions of the line will continue to be important factors in the eventual control of this fire. The tactical team leader and operations supervisor, will evaluate and prioritize these areas on a constant basis.

Alternative B and Alternative D

1. Same as Alternative A.

2. Develop a continuous retardant line down Moose Ridge and construct hand (or blasted line) to connect with an anchor point on constructed line near the Sun River and continue southwestward up Moose Ridge to an anchor point near the Continental Divide.

3. Tie Wapiti Ridge to Washboard Ridge with retardant and/or blasted line (there is a possibility that Wapiti Ridge could be tied to Wrong Ridge as well). If the weather is right, a crew could construct this line through vulnerable spots on the ridge.

4. Same as Alternative A.

5. Same as Alternative A.

Alternative C

1.,2.,4.,5. Same as Alternative A

3. Construct line from an anchor point near the Continental Divide north eastward against the fire edge across the North Fork of the Sun River to the north end of Wapiti Ridge, supported by retardant drops (10 miles).

Supplement to EFSA Prepared 9-7-88

Approximately one-half inch of precipitation fell on 9/10/88 stopping any significant spread until 9/15/88. No more retardant was used after 9/10/88. Instead the direct attack option was exercised ~~with~~ concurrent with mop-up on hot spots along the North flank. One additional crew was ordered and is in place to help carry out this option.

E. M. Stiger

Meeting held 9-24-88 Peila, Kammerd, Stiger, Casey & Smith

Still need mop-up on North Flank. Ops Chief, IC and FMO feel that due to logistics and weather a 6 person highly fire qualified crew can accomplish as much or more than a 20 person crew. Support would be with one helicopter with bucket. Crew would stay in bunkhouse at Gates Park. Linda Forrest would be retained as cook and Jim Forrest would act as facilities Unit Leader. It is felt that this effort will effectively maintain the containment and mop-up effort throughout Indian Summer up until permanent Snowfall.

E. M. Stiger

APPENDIX G

INCIDENT STATUS SUMMARY

1.date	time	2. initial	update	final	3. incident name	4.number
10/28/88	0830		X		GATES PARK	MT-LCF-816

5. incident commander	6. jurisdiction	7. county	8. type incident	9. location	10. started
BERNIE HILDE	FS	099 TETON	FIRE	BOB MARSHALL WILDERNESS	date 7/12 time

11. cause	12. area involved	13. % contained	14. expected containment	15. est. control	16.declared controlled
LIGHTNING	*50,850	85%	date11/01/88 time	date 11/10/88	date time

17. current threat	18. control problems

19 est. loss	20. est. savings	21. injuries	deaths	22.line built	23. line to build
40,000		0	0	62.0 MILES	26 MILES

24. current weather	25. predicted weather	26.cost to date	27.est. total cost
WS CALM temp 12 OVERCAST	ws HIGH temp wd PRESSURE rh	803,771	805,000

28. AGENCIES

29. RESOURCES	FS																TOTALS	
kind of resource	SR	ST	SR	ST	SR	ST	SR	ST	SR	ST	SR	ST	SR	ST	SR	ST	SR	ST
ENGINES																		
DOZERS																		
CREWS	2/ 3																2/3	
HELICOPTERS																		
AIRTANKERS																		
TRUCK COS.																		
RESCUE/MED.																		
WATER TENDERS																		
OVERHEAD PERSONNEL	1																1	
TOTAL PERSONNEL	4																4	

30. Cooperating Agencies

31. Remarks

*Acreage adjusted - 50,850 as of 9/15/88

32. Prepared by	33. Approved by	34. Sent to date	time	by
T.EASTERLY	R. J. CASEY	10/28/88	0900	T. EASTERLY

5100-11 (ICS209)

APPENDIX H

REHABILITATION PLAN
GATES PARK FIRE
9/20/88

An Interdisciplinary Rehab Team has reviewed the Gates Park Fire and submits this plan for restoring land affected by fire suppression efforts. The team consists of the following members:

Tim Love	Resource Assistant
Ray Mills	Wilderness Ranger
Norm Kamrud	FMO
Sonny Stiger	Fire/Fuels Specialist
Seth Diamond	Wildlife Biologist
Valdon Hancock	Forest Hydrologist

The Gates Park Fire is located entirely on lands administered by the Lewis and Clark National Forest.

Fire suppression impacts on the Gates Park Fire that need to be addressed include:

1. Fire lines
2. Base camps, heli-spots
3. Property damage (structures, fence, trails)

FIRE LINES

All fire lines were relatively low impact and built with wilderness values in mind. Where these lines have a gradient of 25% or steeper waterbars should be installed every 50 feet to divert water from the line.

Woody material should be intermittently placed in lines to act as sediment traps.

After fire spread is secured, deep firelines and cup trenches should be filled in .

Stumps from cut trees should be cut flush near ground level.

Trees (pole size or smaller) and large size brush that was cut during fireline construction should be scattered to appear natural.

BASE CAMPS/HELI-SPOTS

Restore campsites and helispots to as near "natural conditions" as possible.

Scatter fireplace rocks, charcoal from fire; cover fire ring with soil; blend area with natural covering.

Remove all garbage and signs of human activity.

Cover, fill in latrine sites.

Consider closing base camps for restoration.

PROPERTY DAMAGE

Wrong Creek Cabin

The following specifications have been submitted in a replacement order for a new cabin:

Size:	16' x 22' one-room cabin with 8' covered porch.
Type:	Log construction (±10" logs). Round with three windows and one door.
Specs:	Front window: 3' x 3' Front door Side windows (2), one on each side, 4' x 4' 2 x 10's on 16" centers for floor system Floor of porch, redwood Floor of cabin, hardwood (3/4" oak) 2 x 10 floor joists in loft with 2/3 loft Roofing - cedar shakes treated with fire retardant 2 x 8 rafters on 16" centers with 9/12 pitch 5/8" plywood sheeting Foundation - treated 6 x 6 (min) on cement pads @ 6' intervals Quote should include caulking and windows. USFS will fly materials to site. Contractor will assemble on site.

Hay

Twenty bales and 800 lbs pellets

Corrals

Replacement of posts and rails

Pasture Fence

One mile jackleg with poles

GATES PARK FACILITIES

Hay

Twenty bales

Pasture Fence

Two miles, jackleg with poles. Set post by airstrip.

Corral

Replacement of posts and rails

Toilet

Replace with logs; cut, peel and dry

Saddle Storage Shed

12 x 12 log structure

*TRAILS**

The following trails should be opened up as soon as possible. They have been listed by priority.

Trail #109	Esst Side Sun River	7.7 miles
Trail #110	North Fork Sun River	2.8 miles
Trail #129	Beartop	3.0 miles
Trail #111	Rock Creek	1.0 miles
Trail #130	Red Shale	12.0 miles
Trail #175	Wall	12.0 miles
Trail #151	North Fork Lick	7.1 miles
Trail #117	Wrong Creek	2.0 miles
Trail #167	South Fork Red Shale	1.75 miles
Trail #166	Moose Gates	1.0 miles
Trail #198	Dryden	
Trail #128	Biggs	
Trail #108	Route	2.5 miles
Trail #164	Ray	5.0 miles
Trail #199	Sulphur	
Trail #165	Headquarters	6.0 miles
Trail #132	Moonlight	1.5 miles
Trail #161	Lick Creek Trail	3.0 miles
Trail #162	Gates Creek Trail	2.0 miles

* See Attached Reports

Trail Signs Burned

#109	4
#110	8
#111	4
#130	4
#165	2
#167	2

Possible Reseeding Projection

If it is determined that it is necessary to seed, then the following seed mixture should be used:

Species	*Lbs, PLS/Acre*	
Slender Wheatgrass	Agropyron Trachycaulum	4.0
Thick Spike Wheatgrass	Agrppyron Dasytachyum	5.0
Mountain Brome	Bromus Margeinatus	4.0
		13.0

AUGUST 8, 1988

NORTH FORK SUN TRAIL #110

Amount damage at this time -	4 miles
Number trees down	192
Time to clear	6 mandays
Cost	$390
Structure damage	none at this time, but fire is burning within 100' of 3 - a 30', 36' & 45'

This estimate is not complete because of hot fire along trail #110.

The following trails must be opened up as soon as possible as they call for administrative purposes:

Trail #109
Trail #110
Trail #111
Trail #164
Trail #165
Trail #129
Trail #166

Trail signs burned:

#109 - 4
#110 - 8
#111 - 4
#130 - 4
#164 - included 109 & 110
#165 - 2
#167 - 2

FACILITIES LOST AT GATES PARK

Pasture fence - 1/2 mile to date, set post and rail
Time to replace - 20 mandays (includes cutting & peeling rails & posts)
Cost to replace - $1300

Corral - west side burned, replace 12 rails & 2 posts
Time to replace - 3 mandays (includes cutting & peeling)
Cost to replace - $195

Toilet - replace with log - cut, peel, dry
Time to replace - 12 mandays
Cost to replace - $1280 (materials = $500, 12 mandays = $780)

Saddle storage shed - 12' x 12' log
Time to replace - 18 mandays
Cost to replace - $2320 (materials = $900, 18 mandays = $1170)

PACK GEAR & EQUIPMENT LOST WHEN RAY CREEK BLEW UP

3 sets 7' X 7' mantees -	$180
3 sets ropes -	$45
Misc. hand tools -	$75
Chainsaw	
800' Mark III hose	

TRAIL #109 EAST SIDE TRAIL (secondary)

Amount damage - 4.5 miles at this time (7.7 total miles possible damage in near future)
Logs down - 126, 12" to 30" diameter

Time to cut out	6 mandays
Cost to cut out	$390

Structures destroyed - 1 - 15', 2 - 30', 1 - 45', 1 - 56', 1 - 90'

Time to replace	20 mandays
Cost to replace	$1300

Water bars destroyed - 18

Time to replace	4 mandays
Cost to replace	$270

Tread repair - 1/2 mile (Spruce Creek & Un-named Creek)

Time to replace	10 mandays
Cost to replace	$650

Total cost = $2610

BEARTOP LOOKOUT TRAIL #129

Amount damage - 3 miles intermittent damage
Logs down - 77

Time to open	6 mandays
Cost to open	$390

This trail scheduled reconstruction - 91(FY)

ROCK CREEK TRAIL #111

Amount damage - 1 mile (more may burn later)

Trees down	48 (varying 8" to 24" diameter)
Time to log out	3 mandays
Cost to log out	$195

Native material structures - 75' log germ turn pike

Time to repair tread	1 manday
Cost to repair tread	$65

Log cribbing lost - 75'

Time to replace	2 mandays
Cost to replace	$130

Water bars lost - 8

Time to replace	1 manday
Cost to replace	$65

Total cost = $585
Doesn't appear to be that many more trees will come down unless reburning occurs.

RED SHALE TRAIL #130

Amount damage - 5 miles (due to hot burning, only 1 1/2 miles were checked however, it appeared 5 miles had burned or was burning.)
Trees down - 28 in first mile in open timber 15" to 28" diameter
- 64 in spruce bottom, 1/2 mile checked, 20" to 36" diameter
- est. total trees down = 512

Time to log out	18 mandays
Cost to log out	$1170

Native material structures - all 7 (however, scheduled for reconstruction for FY89)

Time to repair tread	15 mandays
Cost to repair tread	$975

Water bars destroyed - 48 (tread repair 3500')

Time to replace	4 mandays
Cost to replace	$260

Total cost = $2305

Estimate about 50% of trees are down, particularly if reburning occurs.

WAY TRAILS (Red Shale - Licks Cr. #161, Gates Cr. Trail #162)

Amount damaged - 3 miles of trail #161
2 miles of trail #162
Total damage = 5 miles
Logs down per mile - 80 (10" to 28" diameter)

Time to log out	13 mandays
Cost to log out	$780

Will be very important to open up to monitor fire recovery and for future access to main fire area.

RAY CREEK TRAIL #164 (secondary)

Amount damaged - 5 miles (first 2 miles checked)
Trees down - 3

Time to log out	6 mandays
Cost to log out	$390

Structures damaged - 1 - 24', 1 - 40', 1 - 76'

Time to replace	12 mandays
Cost to replace	$780

Water bars destroyed - 10

Time to repair	1 manday
Cost to repair	$65

Total cost = $1235

MOOSE - ROCK CREEK TRAIL #166

Amount damaged - 1 mile
Trees down - 36

Time to cut out	2 mandays
Cost to cut out	$130

Tread repair & Water bar replacement

Time to repair	2 mandays
Cost to repair	$130

Total cost = $260

SOUTH FORK RED SHALE #167

Amount damaged - 1.75 miles to date
Trees down - 185 (12" to 36" diameter)
- Time to log out — 8 mandays
- Cost to log out — $520

Water bars destroyed - 36
- Time to repair — 6 mandays
- Cost to repair — $390

Total cost = $910

HEADQUARTERS #165

Amount damaged - 6 miles
Trees down - 217 will need to be cut (anything that can be thrown out was not counted)
- Time to log out — 10 mandays
- Cost to log out — $650

Native material structures - 3 lost - 1- 28', 1 - 20', 1 - 14'
- Time to replace — 6 mandays
- Cost to replace — $390

Water bars destroyed - 90 (almost all were burned up)
- Time to replace — 8 mandays
- Cost to replace — $520

Log cribbing lost - 300'
- Time for log cribbing — 10 days
- Cost for log cribbing — $650

Tread damage - 5280' (under cutting & by filling with rolling rock)
- Time to repair — 25 mandays
- Cost to repair — $1625

Total cost = $3835

Entire drainage burned, but damage to trail was limited to 6 miles - most downfall occurred in the first two miles from Junction with trail 109 and last mile of timber at the upper end of drainage.

Tread damage occurred mainly from the Beartop Gorge eastward.

Water bar replacement is entire length. About 70 needed east of Beartop Gorge remain. 20 from Junction 109 to Gorge.

Estimate that about 65% of trees burned off have fallen.

FIRE DAMAGE - Red Shale Trail #130 - Mainline Trail

Total Length: 7 miles
Length Fire Damaged: 3.5 miles

Average # trees down per mile: 228
Consisting of large Spruce 18" to 42" and Lodge Pole 10" to 28" varying from single trees to piles of eight trees in a cluster to 5' high.

Cost to cut out 48 man days @ $65.00 =	$3120
2500' reroute to remove from swampy =	$3900
Spruce bottom 60 man days =	
Replacement of 6 native material trail structures including packing	
Supplies 125 man days =	$8125
Structures vary from 24' to 45'	
	$15145

FIRE DAMAGE: Wall Trail #175 = mainline trail
Total Length: 12 miles
Length Fire Damaged: 3 miles from pass between Red Shale and S. Fk. Lick Creek to pass between middle fork Lick Creek and north Fork Lick Creek.

Trail Recon.

Average of trees per mile: 135 consisting of large Alpine Fir, Lodge Pole and Spruce 10" to 34" in diameter. Water bars have been destroyed, 60 to replace.

Cost of Project

Cleaning 15 man days @ $65.00 =	$975
Water Bar replacement 12 man days =	$780
Rock removal and Tread repair 20 man days -	
	$1300
	$2055

FIRE DAMAGE: Trail #151 N. Fk. Lick Creek (mainline trail)
Trail Length: 7.1 miles
Trail Length Damaged: 3.4 miles

Trail Recon.
Average # of trees down per mile: 165 consisting of Lodge Pole pine, Alpine Fir, and Spruce 10" to 28" in diameter. These trees range from a single tree to 4 in a cluster along the entire 3.4 miles.

Cost to cut out: 30 man days =	$1950
Water bars & erosion control: (25 bars)	
6 man days =	$390
Tread Repair 1800' - 12 man days =	$780
	$3120

*see first notes

Additional FIRE DAMAGE: Trail 110 caused by fire run 9/7.

Trail Recon.

Trail length damaged: 2.8 miles from Lick Cr. to Monroe Creek. The burned stand is predominate Lode Pole Pine 6" to 18" in diameter.
Average down trees per mile: 128
Trail Structures cost (2) 18' - 26'

Cost to Clear 18 man days =	$1170
Drainage 5 man days =	$325
Replace Structures 10 man days =	$650
	$2145

FIRE DAMAGE: Trail 108 Route Creek mainline fire run 9/7. Trail length damaged 2.5 miles from trail 110 to 11 mile Park - Lodge Pole pine 10" to 22" in diameter Spruce 14" to 30" diameter.

Average down trees per mile: 130 - Cost $1170

Drainage =	$325
1 structure 18' =	$390
	$1885

FIRE DAMAGE: Wrong Creek Trail #117 - Secondary & snow survey fence run 9/7.

Trail length damaged: 2.0 miles from trail 110 to 1 mile North of old cabin site. Lodge Pole Pine 6" to 22" in diameter. Alpine Fir 8" to 18"

Cost to cut out - 15 man days =	$975
Drainage and water bars - 12 man days =	$780
Rock removal and tread repair - 6 man days =	$390
	$2145

FIRE DAMAGE: Moonlight Park Trail #112 - Secondary

Total trail length: 5.0 miles
Trail length damaged: 1.5 miles
Average # of down trees per mile: 165 - consisting of Lodge Pole Pine & Alpine Fir 10" to 28" in diameter. Two trail structures - cost 14' and 22' extensive damage improvement needed.

Cost to clear: 15 man days =	$975
Structure Replacement:	$650
Drainage Replacement	$650
	$1275

APPENDIX I

POST FIRE STUDIES

APPENDIX I

GSTES PARK FIRE MONITORING

To better understand the fire's effects and to track the recovery of the land, the Forest has initiated a multi-faceted monitoring program. Hydrological response of the burned watersheds, possible effects on fisheries, and short term and long term vegetation recovery are the major components of the monitoring program. Complementary to these studies, photographic plots (photopoints and transects) have been established at several locations.

Watershed Monitoring

There are four parts to the watershed monitoring program for the Gates Park Fire:

1. Sediment survey of Gibson Reservoir. The Bureau of Reclamation made a survey of Gibson Reservoir sedimentation in 1973. A survey in 1988 and again in five years (1993) will provide a measure of the change in sediment in the reservoir during the five years following the Gates Park Fire, which can be compared to the sedimentation rates in the previous period (1973-1988). The Northern Regional Office of the Forest Service has used existing aerial photos taken in early August to make a topographic map of the reservoir as of August 1988. The Bureau of Reclamation has agreed to use this map to establish storage capacity of Gibson Reservoir for determination of changes in capacity due to sedimentation.

2. Miscellaneous monitoring of general watershed conditions. This monitoring emphasizes photo points and descriptions but includes channel condition and watershed condition. Photographs taken on August 8 and again on October 18, 1988 after a significant rainfall event show no change in the appearance of the stream channels near the mouths of Ray and Headquarters Creeks. Aerial photographs are also being used to identify general impacts.

3. Monitoring of streamflow on the North Fork Sun River. The streamflow station that operated there until 1968 has 20 years of record concurrent with regular measurements on 4 snow courses, plus other weather data. Operation of this station for 5 years will quantify fire effects in a comparison situation that is seldom available. The Bureau of Reclamation and the Forest Service is jointly funding the U. S. Geological Survey (USGS) to re-establish and operate this station. The station was re-established on May 1-3 and has been continuously operated since that date.

4. Monitoring of sedimentation near the streamflow station to supplement the reservoir sediment data with data on immediate transport, timing, deposition, and origin of sediment. This is also a cooperative project with the same group operating the streamflow station, with assistance by the Greenfields Irrigation District. There are two parts to sediment monitoring, as follows:

1. The USGS is using standard sampling techniques to measure sediment at the time of their monthly service trips to the streamflow station.

2. The Forest has installed an automatic water sampler near the streamflow station (under the pack bridge at the mouth of the North Fork Sun River) to maintain a daily sampling for sediment that can be compared with the standard manual methods of the USGS to provide a continuous record of sediment discharge from the North Fork Sun River. Dick Klick, for the Irrigation District, is servicing this sampler and is transporting the samples to the Forest Service for lab analysis. The sampling is under the technical direction of Valdon Hancock, Forest Hydrologist. Currently data is available on a six-hour interval from May 1 to Aug. 15, 1989, and on a 12-hour interval thereafter.

This data so far indicates that there is a high sediment peak for a few days following severe summer thunderstorms. This high sediment in the stream is visually striking as compared to the South Fork Sun River, although there is no data base on sediment for comparison in the North Fork Sun River.

Fishery Monitoring

Fish population and stream habitat data were collected from the North Fork Sun River. Selection of drainages to be sampled was coordinated with the Montana Department of Fish Wildlife and Parks. Approximately 13 stream miles were surveyed. The composition, structure, and abundance of fish populations were sampled using a battery-powered electrofisher. Habitat data collected included alkalinity, temperature, channel type, riparian vegetation, pool/riffle/run ratio, and % fine sediments. The percentage of fine sediments was determined using the substrate grid technique. The following streams in the North Fork Sun River drainage were surveyed:

North Fork Sun River
Headquarters Creek
Ray Creek
Red Shale Creek
Gates Creek
Wrong Creek
Lick Creek.

Vegetation Monitoring

A considerable amount of pre-fire baseline data is available in the burned area that greatly enhances our opportunity to monitor plant community changes resulting from the fire. In 1987 over 30 descriptive vegetation plots were established within the area subsequently burned by the Gates Park fire as part of a remote sensing - Grizzly bear habitat mapping project. These plots were measured using Ecodata fastplot methodology. In October of 1988, after the fire, several more detailed permanent monitoring plots were established and photographed by Wayne Phillips. In the summer of 1989, many of these vegetation plots were re-read and re-photographed; and mapped and permanently marked for relocation, as described below. A continuing opportunity exists to understand and track long term plant succession using this data base.

Ecodata is a standardized, integrated resource inventory methodology with several levels of detail. The most intensive technique records canopy coverage and rooted frequency in replicated microplots sampled along transect lines in a 1/10th acre plot representative of a stand. Four of these plots were sampled and re-photographed in 1989, in the following locations:

1. Plot F039. Headquarters Creek south facing slope. High intensity, high severity fire in old growth Douglas-fir and Lodgepole Pine forest on a gently-sloping, alluvial landform. 100% of tree crown and above ground vegetation consumed.

2. Plot F040. Headquarters Creek north facing slope. High intensity, moderate severity fire in old growth Douglas-fir and Lodgepole forest on a lower slope position. 100% of tree crown and above ground vegetation consumed.

3. Plot F044. Wrong Creek gently sloping bench. Low intensity, low severity fire in a young stand of Subalpine fir, Lodgepole, and Spruce. 20% of trees undamaged, the other 80% with some scorched needles but only one tree with crown consumed.

4. Plot F045. Wrong Creek gently sloping bench. Moderate intensity, low severity fire in a young stand of Subalpine fir, Lodgepole, and Spruce. 30% of trees had crowns consumed, the rest with some scorched needles remaining.

Seven of the 1987 vegetation plots were re-sampled in 1989 using Ecodata ocular plot methodology. This technique scores visual estimates of canopy coverage for each species along with their age/size distribution. Two additional ocular plots were established to widen the range of stands sampled. These plots were located as follows:

1. Plot F029. Head of Ray Creek on moderate south slope. High intensity, moderate severity fire in old growth Subalpine fir, Spruce, and Whitebark Pine forest. 100% of tree crowns and above ground vegetation consumed. Plot compared to Oct. 1988 photos.

2. Plot F034. Headquarters Creek moderate northwest slope. High intensity, moderate severity fire in old growth Spruce with Subalpine fir understory, Abla/Mefe habitat type. 100% canopy and understory vegetation consumption. Comparison plot is S299.

3. Plot F035. Headquarters Creek steep northwest slope. High intensity, moderate severity fire in old growth Spruce and Subalpine fir forest, Abla/Mefe habitat type. 100% canopy and understory consumption. Comparison plot is S300.

4. Plot F036. Headquarters Creek steep northwest slope. High intensity, high severity fire in mixed old growth forest of Spruce, Douglas-fir, Subalpine fir and Lodgepole, Abla/Vasc habitat type. 100% canopy and understory consumption. Comparison plot is S302.

5. Plot F037. Headquarters Creek moderate south slope. High intensity, high severity fire in mixed old growth Spruce, Subalpine fir, and Lodgepole forest, Abla/Mefe habitat type. 100% canopy and understory consumption. Comparison plot is S171.

6. Plot F038. Headquarters Creek gentle west slope. High intensity, moderate severity fire in old growth Spruce, Subalpine fir, and Whitebark Pine forest, Abla/Mefe habitat type. 100% canopy and understory consumption. Comparison plot is 2-50.

7. Plot F041. Mouth of Headquarters Creek gentle south facing bench. Moderate intensity, low severity fire in mature Lodgepole and Subalpine fir, Abla/Libo habitat type. Comparison plot is A59.

8. Plot F042. East of Gates airstrip, gentle west slope. Low intensity, low severity fire in young mixed forest of Spruce, Subalpine fir, and Lodgepole, Abla/Libo-Libo habitat type. Comparison plot is A70.

9. Plot F043. East of Gates airstrip, west facing bench. Low intensity, low severity fire in old, open-grown Lodgepole with Spruce, Subalpine fir, and Aspen understory, Abla/Vagl habitat type. No comparison plot.

APPENDIX J

Rocky Mountain Ranger District
Lewis & Clark National Forest
1988 Summary

Date Detected	Name	Cause	Status	Final Size	Final Cost	Remarks
6/12	Hannan Gulch	Person	Wildfire	.1 ac.	$200	
6/23	Blacktail Cr.	Lightning	Wildfire	.2 ac.	$500	
6/26	South Fork	Lightning	Wildfire	.1 ac.	$500	Within Wilderness
7/11	Gates Park	Lightning	Prescribed*	50,408 ac.	$805,000	Within Wilderness
7/17	Dry Fork	Lightning	Wildfire	.5 ac.	$3,000	
7/20	Ray Creek	Lightning	Wildfire	.2 ac.	$400	Within Wilderness
7/22	Straight Cr.	Lightning	Wildfire	466 ac.	$750,000	Within Wilderness
7/28	Hidden Lake	*	Wildfire	90 ac.	$75,000	* Escape from Gates Park Fire
8/5	Lodgepole Cr.	Lightning	Wildfire	L&C 217 ac.		Started on the Flathead NF and managed by Flathead
8/15	Stecker	Lightning	Wildfire	.5 ac.	$600	
8/16	Moose Creek	Lightning	Wildfire	.3 ac.	$2,000	Within Wilderness
8/18	Pool Creek	Lightning	Wildfire	10 ac.	$8,000	
8/19	Bear Creek	Lightning	Wildfire	.1 ac.	$2,000	Within Wilderness
8/29	Canyon Creek	Lightning	Prescribed**	L&C 120,119[1]	?	Started on the Lolo NF moved onto L&C on 8/9/88
8/30	Blowout Mtn.	Lightning	Wildfire	10 ac.	$100	

* The Gates Park Fire was declared a wildfire on 9/7/88 due to extreme fire danger

** The Canyon Creek Fire escaped wilderness boundary on 8/29/88 and declared a wildfire 8/30/88

[1]

Inside Wilderness	20,636
Outside on NF	49,537
Private Land	39,874
Bureau Land Mgmt.	906
State Lands	9,166

APPENDIX K

GATES PARK WILDERNESS FIRE

FACT SHEET DISTRIBUTION

FRIDAY, JULY 22:

CHOTEAU (1630-1800)

Court House	Posted on bulletin board Discussed and distributed 12 copies throughout individual offices
Post Office	Posted on bulletin board Discussed and distributed 1 copy to clerk
Sheriff	Discussed and distributed 2 copies to Sheriff and dispatcher
Rexall's	Discussed and distributed 2 copies to 3 employees (1 copy should be posted on window)
IGA	Posted on bulletin board Discussed and distributed 1 copy to clerk
Choteau Steak House	Discussed and distributed 1 copy
Bella Vista Motel Big Sky Motel Glenloyd Motel	Discussed and distributed copies to office(s)

The Choteau community was very appreciative of the effort to inform them of the Gates Park fire, Straight Creek, and Canyon Creek fires. Discussions emphasized the Gates Park fire - individuals seemed comfortable with the situation but were very interested in receiving the fact sheet. I did not encounter any negative comments regarding the present management regime of Gates Park but there were a few questions on why the FS is suppressing Straight Creek.

FAIRFIELD (2000)

Eagle Grocery Food Farm	Discussed and distributed copies to clerks

Could not locate the Sheriff.

SATURDAY, JULY 23:

DUTTON (AM)

Post Office	Posted on bulletin board
Library	Dropped off at Library (closed)

B&B Grocery	Discussed and distributed copies to clerk

Sheriff not available/volunteer fire department closed without any way to post.

REST STOP NORTH OF DUTTON (AM)

Posted on bulletin board and discussed and gave copies to the caretaker who will make sure there's a copy on the board.

COLLINS (AM)

Could not locate any public facility to post sheet.

BRADY (AM)

Post Office	Posted on bulletin board
Library Restaurant	Discussed and distributed copies to staff

CONRAD (PM)

Post Office	No bulletin board available - left copies on counters
Community Center	Dropped off copies for posting (closed)
Chamber of Commerce	Dropped off copies for posting (closed)
Pondera County Courthouse	Posted indoors on bulletin board
City Office	Dropped off copies for posting (closed)
Buttrey	Posted on bulletin board Discussed and distributed 1 copy to clerk
Village Shopping Ctr	Posted on bulletin board Discussed and distributed 1 copy to drug store

PENROY (PM)

Post Office	Posted on bulletin board and 1 copy discussed and distributed to clerk
Fire Department	Dropped off 1 copy to volunteer F.D. (closed)

BYNUM (PM)

Post Office	Dropped off copies to post (closed)

The above towns were also appreciative of the information though not as much as Choteau. No public concerns about the fires.

AUGUSTA (PM)

Post Office	Posted on bulletin board
Lewis & Clark Sheriff	Discussed and distributed 2 copies (1 will be posted)
Cabin owner -Benchmark (talked to her in town)	Discussed and distributed 1 copy
Traders Grocery Buzzard Station East Slope Grocery Mel's Ice Cream Parlor Lazy Bar/Hotel/Cafe	Discussed and distributed copies to each location (Estimated number of people talked to directly: 13)

Augusta was very receptive and friendly - they are receiving a lot of questions about the fires.

Terri Marceron, 7/23/88, 1430

APPENDIX L

United States Department of Agriculture | Forest Service | Lewis & Clark NF | P.O. Box 871 Great Falls, MT 59403

Reply to: 5100

Date: July 26, 1988

To Recreation Cabin Owners, Resort Owners, Outfitters/Guides, and Permittees:

As you are probably aware there are currently two active fires on the Lewis and Clark National Forest and one on the Lolo National Forest that have been visible from many of the towns along the Rocky Mountain Front. You may have been reading about the movement of these fires in our local media and may have some unanswered questions. Maybe I can answer some of them by giving you some additional information.

The **Gates Park Fire** is located in the Bob Marshall Wilderness, approximately 2 miles northwest of Gates Park. The fire was ignited by lightning on Monday, July 11 and was detected by the Beartop Mountain Lookout. In recent years, we have come to realize the benefits of fire. Historically, fire has played a natural role in the Wilderness. It creates vegetative diversity, provides increased forage for wildlife, and helps retain the wild character of the Wilderness. Because the Gates Park fire was ignited by natural causes (lightning) and does not pose a threat to public safety or adversely affect resources adjacent to the Wilderness, it is being managed as a "prescribed" fire. Suppression actions have not been taken on the fire. It is being monitored and evaluated continuously to ensure that it continues to meet our objectives in the Wilderness. As of July 25, the fire has burned 2800 acres to the northwest of Gates Park Station. We expect the fire to continue to burn through August unless weather conditions change. To protect the public from entering the active wildfire area, we have had to close 5 trails in the immediate vicinity of the fire:

1. Trail 130, Red Shale Trail to Sock Lake
2. Trail 164, Ray Creek Trail from North Fork of Sun River to junction with Trail 110
3. Trail 110, Gates Park Trail from Lick Creek to Gates Park Station
4. Unnumbered Trail, Red Shale Cutoff Loop Trail from junction with Trail 110 to junction with Trail 161
5. Trail 161, Red Shale Cutoff Trail from junction with Trail 130 to junction with Trail 151

The **Straight Creek Fire** was reported on July 22, in the Scapegoat Wilderness, approximately two and one-half miles southwest of Wood Lake, in the Benchmark area. This fire was also ignited by lightning. It was

reported by Patrol Mountain Lookout. Although also located in the Wilderness, the situation is very different than the Gates Park fire. We have taken direct suppression action on this fire for several reasons:

1. The location of the fire is on the edge of the Wilderness boundary and could easily have expanded onto the adjacent nonwilderness forest land.
2. At the time of detection, the weather and fire danger conditions indicated that rapid spread was likely.
3. The private cabin and resort structures along the Benchmark Road could have been threatened had the fire expanded onto the adjacent nonwilderness lands.

As of July 25, the fire was estimated at 400 acres. A fire camp has been established at the Benchmark Campground, and is therefore closed to the public. Over 300 people are involved in the suppression efforts. The fire poses **NO THREAT** to the cabins or other structures along the Benchmark Road. Wood Lake Picnic Area and Campground and the South Fork Campground remain open to public use. A pilot car has been leading traffic along the road to reduce vehicle speeds. I have signed a special order restricting speeds to 25 MPH. The Benchmark airstrip has been closed to public landings to allow for fire-related traffic only. The airspace above the fire has also been closed to prevent conflicts with airplane fire retardant drops and helicopter water bucket drops over the fire. To protect the public from entering the active fire area, we have temporarily closed twotrails:

1. Trail 212, Straight Creek Trail from Benchmark to Green Fork
2. Trail 232, Crown Mountain Trail from the Scapegoat Wilderness Boundary to its junction with Trail 212

We are projecting to control the fire by the end of this week, depending on wind and weather conditions.

The **Canyon Creek Fire**, located on the Lolo National Forest portion of the Scapegoat Wilderness has been burning since June 25. It was caused by lightning and remained less than one acre in size for several weeks. Like Gates Park, this fire is being managed as a "prescribed" fire in the Wilderness. no suppression actions have been taken, as the fire has continued to meet the Forest's management objectives. On July 20, the fire became active and burned 100 acres. Since then the fire has increased its perimeter to include a 10,000 acre area. A substantial amount of this area has burned, although several unburned islands remain. Because of the extensive area in active fire, the Lolo National Forest has temporarily closed all of the trails in their portion of the Scapegoat Wilderness. Depending on weather conditions, this fire could also burn the remainder of the summer.

The fire conditions that we are experiencing this summer are a periodic phenomenon of nature. Throughout the years, fire has historically played a major role in changing the vegetative configuration of the forest scene. In the past all forest fires were suppressed. Fires were not permitted to burn and the natural recycling of the forest environment was interrupted. We continue to fight fires outside Wilderness where the Forest can be recycled

with other management practices such as prescribed fire with planned ignitions and timber harvesting. Inside Wilderness, fire is managed as a nature's way of shaping the look and process of the natural forest. We appreciate your cooperation in our efforts to reestablish the natural role of fire in the Bob Marshall and Scapegoat Wilderness.

If you have any specific questions that I have not addressed, please feel free to contact either the Forest Supervisor's Office at 791-7700 or the Rocky Mountain Ranger District at 466-5341.

JOHN D. GORMAN
Forest Supervisor

APPENDIX P

WILDERNESS FIRE PROGRAM
BOB MARSHALL COMPLEX

SOME PEOPLE HAVE EXPRESSED THE CONCERN THAT WE SHOULD BE PUTTING ALL FIRES OUT IN THE WILDERNESS. I WISH IT WERE THAT SIMPLE, BUT UNFORTUNATELY IT'S NOT. WE HAVE ONE OF THE BEST FIRE FIGHTING FORCES IN THE WORLD, BUT EVEN THIS FORCE CANNOT STOP THEM ALL. THIS WAS DRAMATICALLY BROUGHT HOME IN 1987 ALL OVER THE WEST AS FORESTS AND HOMES BUILT IN THOSE FORESTS BURNED. WHY IS THIS? WHAT IS HAPPENING ANYWAY? WHAT IS DIFFERENT? WHAT HAS CHANGED? WELL, VERY SIMPLY THE FORESTS HAVE CHANGED. A FOREST IS A VERY DYNAMIC THING. TREES ARE BORN AND GROW FROM SOME POINT IN TIME. THAT BEGINNING POINT IS USUALLY AS A RESULT OF OLD FIRES IN THE PAST. AS THEY GROW, SOME DIE AND FALL TO THE GROUND AND BECOME FUEL. LIMBS FALL FROM OTHERS AND BECOME MORE FUEL. OTHER FORCES OF NATURE PLAY THEIR ROLE, LIKE WINDSTORMS AND ICE STORMS AND INSECTS THAT ADD MORE AND MORE FUEL. EVEN THE NEW, YOUNG TREES THEMSELVES ADD TO THE FUEL COMPLEX AS THEY GROW THICK IN AND AMONG THE OLD TREES AND DEAD FUEL ON THE GROUND. THESE YOUNG TREES PRODUCE WHAT FIRE FIGHTERS CALL "LADDER FUELS" ALLOWING A FIRE TO CLIMB FROM A SMALL "SURFACE" FIRE UP INTO THE TOPS OF TREES RESULTING IN A "CROWN" FIRE RACING THROUGH THE TREE TOPS AND COVERING LARGE AREAS.

SOME KINDS OF TREES IN OUR LOWER ELEVATIONS, LIKE PONDEROSA PINE AND DOUGLAS-FIR, EXPERIENCED LIGHTING CAUSED FIRES AT INTERVALS OF LESS THAN ABOUT 50 YEARS PRIOR TO OUR INTENSIVE FIRE FIGHTING EFFORTS. OTHERS, LIKE LODGEPOLE PINE, SPRUCE AND ALPINE FIR, AT HIGHER ELEVATIONS, EXPERIENCED THESE FIRES AT INTERVALS USUALLY GREATER THAN 100 TO 150 YEARS.

THE FIRES AT THE LOWER ELEVATIONS WERE USUALLY MORE FREQUENT AND THUS OF LOW INTENSITY. THEY THEREFORE KEPT THE FORESTS RATHER "CLEAN" OF FUELS BY BURNING THEM UP BEFORE THEY ACCUMULATED TO THE LEVEL THEY ARE TODAY. IN ADDITION, AS A RESULT OF THESE FIRES, FORAGE GRASSES AND BROWSE WERE MORE ABUNDANT FOR WILDLIFE. FIRES AT THE HIGHER ELEVATIONS ARE USUALLY LESS FREQUENT AND, DURING EXCEPTIONALLY DRY YEARS, WERE MORE INTENSE COVERING LARGE AREAS.

THE TREES ADAPTED ACCORDINGLY THROUGH THE AGES. PONDEROSA PINE CAN EASILY WITHSTAND A LOW INTENSITY "SURFACE" FIRE AT RATHER FREQUENT INTERVALS, WHEREAS THE LODGEPOLE PINE AT HIGHER ELEVATIONS ADAPTED IN A DIFFERENT WAY. IT REQUIRES A FOREST REPLACING KIND OF "CROWN" FIRE TO OCCUR SO THAT IT CAN REPRODUCE ITSELF.

SO WHAT HAS CHANGED? WHY ARE WE HAVING SO MUCH TROUBLE NOW? OUR FORESTS, BOTH AT LOWER ELEVATIONS AND AT HIGHER ELEVATIONS, ARE NOW AT A VERY FLAMMABLE STATE BECAUSE OF A VERY "UNNATURAL" ACCUMULATION OF FUEL. THE REASON FOR THIS IS THAT MOTHER NATURE RULED SUPREME UP UNTIL ABOUT THE 1930S. BY THIS , I MEAN THAT FIRES STARTED BY LIGHTNING AND BY NATIVE AMERICANS, BURNED FREELY. AT THE LOWER ELEVATIONS THESE FIRES OCCURRED FREQUENTLY AND KEPT THE FUELS BURNED OUT FROM UNDER THE LARGER TREES AND KEPT THE FORESTS FREE OF UNDERGROWTH AND DEAD WOOD. AT THE HIGHER ELEVATIONS THESE FIRES, THOUGH OCCURRING AT LONGER INTERVALS, BURNED LARGE AREAS OUT OF THE OLD FOREST. IN THEIR PLACE, A FOREST OF

YOUNG TREES SPRANG UP. THESE LARGE AREAS OF YOUNG TREES ARE RELATIVELY "FIRE PROOF" BECAUSE MANY OF THE OLD TREES AND MUCH OF THE DEAD TREES AND LIMBS ON THE GROUND AND THE UNDERGROWTH WAS BURNED UP. THESE AREAS OF YOUNG TREES BROKE UP THE OLD GROWTH SO THAT WILDFIRES COULD NOT BURN OVER UNNATURALLY LARGE AREAS.

IN THE BOB MARSHALL WILDERNESS COMPLEX WELL OVER HALF THE TOTAL LAND AREA WAS BURNED OVER BETWEEN 1885 AND ABOUT 1930. IN 1889 ALONE, OVER 150,000 ACRES BURNED ACCORDING TO NATURE'S PLAN IN THE AREA NOW COVERED BY THE WILDERNESS. HOWEVER, IN 1910, WELL OVER 400,000 ACRES BURNED WITHIN THE BOB MARSHALL COMPLEX BOUNDARIES. A POINT TO REMEMBER, HOWEVER, IS THAT IN 1910, MANY OF THE DEVASTATING WILDFIRES THAT BURNED TOWNS AND TOOK SO MANY LIVES WERE SPAWNED BY SLASH DEBRIS THAT WAS LEFT OVER FROM LOGGING OPERATIONS THAT HAD NOT BEEN "CLEANED" UP PROPERLY THROUGH THE USE OF PRESCRIBED FIRE.

THESE FORESTS ARE NOW CLOSE TO 100 YEARS OLD AND ALONG WITH THE AREAS THAT DID NOT BURN AT THE TURN OF THE CENTURY, ARE PRIMED AND READY TO BURN AGAIN!

MAN, NOT UNDERSTANDING NATURE'S ROLE FOR FIRE IN THE GREATER SCHEME OF THINGS, TRIED TO SUPPRESS ALL FIRES IN THE FORESTS SINCE THE 1930S. WE WERE PRETTY SUCCESSFUL AT THIS BECAUSE THE FUELS HAD NOT ACCUMULATED TOO MUCH YET. BUT RECENTLY WE ARE EXPERIENCING MORE AND MORE LARGE AND DEVASTATING, "UNNATURAL" WILDFIRES!

WE CAN DO SOMETHING ABOUT IT! THERE ARE TWO KINDS OF FIRE. WILDFIRE AND PRESCRIBED FIRE (OR MANAGED FIRE). A WILDFIRE IS AN UNWANTED FIRE. ONE THAT REQUIRES A SUPPRESSION EFFORT. A PRESCRIBED FIRE IS A FIRE BURNING UNDER SPECIFIED CONDITIONS WHICH WILL ACCOMPLISH PLANNED OBJECTIVES. THE LAND MANAGEMENT AGENCIES HAVE STUDIED THE NATURAL ROLE OF FIRE AND REALIZE THAT WE MUST REINTRODUCE FIRE BACK ONTO THE LAND IN ORDER TO MIMIC MOTHER NATURE AND HEAD OFF THIS TREND OF "UNNATURAL" LARGE, DEVASTATING FIRES THAT HAVE OCCURRED IN RECENT YEARS.

IN AREAS OUTSIDE OF THE WILDERNESS, THIS IS DONE MOSTLY BY PLANNED PRESCRIBED FIRES TO BURN THE FUELS OUT FROM UNDER THE LARGER TREES OR IN THE CASE OF A TIMBER HARVEST, TO BURN THE DEBRIS LEFT OVER FROM THE LOGGING OPERATION IN ORDER TO START A NEW FOREST, NOT UNLIKE MOTHER NATURE DOES WHEN SHE USES FIRE TO CLEAN UP THE FOREST. BACK IN 1968 THE NATIONAL PARK SERVICE BEGAN PRESCRIBED BURNING IN THE SEQUOIA GROVES. THEY HAD FOUND THAT STOPPING ALL FIRES THAT OCCURRED HAD RESULTED IN A DANGEROUS ACCUMULATION OF FUELS WHICH, IF BURNED ACCIDENTALLY, COULD HAVE DESTROYED THE BIG TREES. THE ELIMINATION OF NATURAL FIRES HAD ALSO RESULTED IN OTHER TREES FILLING IN THE FORMERLY OPEN FORESTS AND EFFECTIVELY WAS PREVENTING GIANT SEQUOIA SEED GERMINATION. IN 1972, THE U S FOREST SERVICE INITIATED A PROGRAM OF ALLOWING CERTAIN LIGHTNING FIRES TO BURN AS PRESCRIBED FIRES IN WILDERNESS AREAS IN ORDER TO ALLOW FIRE TO "PLAY A MORE NATURAL ROLE" IN WILDERNESS ECOSYSTEMS. THE FOREST SERVICE POLICY GOES ON TO STATE "FIRE, OR ITS ABSENCE, HAS PROBABLY HAD A MORE PROFOUND EFFECT ON NATURAL LIFE SYSTEMS THAN ANY OTHER SINGLE FACTOR OR COMBINATION OF FACTORS. NATURAL FIRE HAS BEEN A PART OF THE ECOLOGY OF THE WILDERNESS SINCE CREATION, AND MAN'S EFFORTS TO BAN THIS AGENT MAY HAVE RESULTED IN SIGNIFICANT ECOLOGICAL CHANGES IN THE FLORA AND FAUNA OF SOME AREAS. SIMILARLY, FIRE ACCIDENTALLY OR PURPOSEFULLY INDUCED IN WILDERNESS HAS INTERFERED WITH THE NATURAL PROCESSES WHICH ARE

TO DOMINATE AREAS SET ASIDE AS WILDERNESS. ..." IN ADDITION RECENT POLICY ALLOWS FOREST SERVICE MANAGERS TO IGNITE PRESCRIBED FIRES IN WILDERNESS TO REDUCE UNNATURAL BUILDUPS OF FUELS, BUT SEVERAL STRICT CRITERIA MUST BE MET FIRST. ONE OF THESE BEING THAT LIGHTNING CAUSED FIRES CANNOT NATURALLY TAKE CARE OF THE UNNATURAL FUEL BUILD UP OR USING LIGHTNING FIRES AS PRESCRIBED FIRES MIGHT POSE A SERIOUS THREAT TO LIFE AND PROPERTY WITHIN THE WILDERNESS OR RESOURCES OUTSIDE THE WILDERNESS.

ALL FIRES OCCURRING IN A WILDERNESS AREA ARE NOT SIMPLY ALLOWED TO BURN FREELY WITHOUT ANY MANAGEMENT. QUITE THE CONTRARY. A VERY SOPHISTICATED DECISION PROCESS MUST BE FOLLOWED. FIRST THERE MUST BE A SPECIFIC FIRE PLAN PREPARED FOR THE WILDERNESS AREA. A FIRE PLAN WAS APPROVED FOR THE SCAPEGOAT WILDERNESS IN 1981 AND FOR THE BOB MARSHALL AND GREAT BEAR WILDERNESS AREAS IN 1983. WHENEVER A FIRE STARTS IN ONE OF THESE WILDERNESS AREAS SEVERAL THINGS TAKE PLACE IMMEDIATELY. A DECISION MUST BE MADE AS TO WHETHER THE FIRE IS LIGHTNING CAUSED OF PERSON CAUSED. SUPPRESSION ACTION IS TAKEN ON ALL PERSON CAUSED FIRES IMMEDIATELY. AT THE SAME TIME A TEAM OF FOREST SERVICE MANAGERS AND SPECIALISTS ARE NOTIFIED. IF THE FIRE IS LIGHTNING CAUSED, THEIR TASK IS TO DETERMINE IMMEDIATELY IF LIFE OR PROPERTY IS ENDANGERED, IF THE FIRE IS AN IMMEDIATE THREAT TO THE AREA BOUNDARY, IF SMOKE CONDITIONS WILL BE INTOLERABLE AND IF FUELS ARE TOO DRY TO ALLOW TIME FOR A TIMELY DECISION TO BE MADE. IF ANY OF THE ANSWERS TO THESE QUESTIONS ARE YES SUPPRESSION ACTION IS TAKEN IMMEDIATELY. FOR INSTANCE, WHILE THE PRESCRIBED FIRES WERE BURNING IN THESE WILDERNESS AREAS IN 1988, SEVERAL OTHERS WERE IMMEDIATELY SUPPRESSED. AND, I MIGHT ADD, THIS TOOK SOME DOING ON SEVERAL OF THEM BECAUSE OF THE DRY CONDITIONS THIS YEAR. ONE GREW TO ABOUT 500 ACRES AND THE OTHER TO ABOUT 700 ACRES BEFORE THEY COULD BE STOPPED.

AFTER IT IS DETERMINED THAT A FIRE COULD BE DESIGNATED A PRESCRIBED FIRE, STILL MORE DECISIONS MUST BE MADE. SOME OF THESE ARE:

1. UNDER THE PRESENT AND FORECASTED WEATHER, WHAT WILL BE THE MAXIMUM SIZE OF THE FIRE?
2. ARE FORCES AND DOLLARS AVAILABLE TO MANAGE THIS FIRE AS A PRESCRIBED FIRE?
3. WHAT ARE THE PROJECTED BENEFITS AND DAMAGES BOTH ON-SITE AND OFF-SITE?
4. WHAT IS THE SUPPRESSION CAPABILITY AND COST?

WHEN ALL FACTORS ARE EVALUATED, THE LINE OFFICER MAKES THE DECISION WHETHER TO DESIGNATE THE LIGHTNING FIRE A PRESCRIBED FIRE OR NOT. ONCE THAT DECISION IS MADE, THE PRESCRIBED FIRE MUST BE MONITORED AND RE-EVALUATED EVERY DAY THAT THERE IS ANY SIGNIFICANT BURNING TO BE SURE THAT THE SITUATION HAS NOT CHANGED AND THAT THE FIRE CAN CONTINUE TO BURN AS A NATURAL PHENOMENON, CHANGING THE COMPLEXION OF THE WILDERNESS JUST AS MOTHER NATURE INTENDED.

ASIDE FROM BREAKING UP AREAS OF HEAVY FUELS, WILDLIFE HABITAT WILL BE IMPROVED BY PROVIDING MORE DIVERSE VEGETATION AND INCREASED "EDGE". BROWSE AND GRASS WILL BE REJUVENATED FOR WILDLIFE FOOD. ESTHETICS WILL BE IMPROVED IN THE LONG RUN BY ALLOWING ASPEN A CHANCE TO SPROUT AND SPREAD BACK INTO THE OPENINGS CREATED BY THE FIRE.

PROBABLY THOSE MOST IMPACTED BY THE CURRENT WILDERNESS FIRES ARE OUTFITTERS AND GUIDES AND OTHER RECREATIONISTS THAT MAY HAVE HAD TO CHANGE THEIR PLANS FOR THIS SUMMER. SOME OF THE OUTFITTERS AND GUIDES ALSO HAVE CORRALS AND OTHER IMPROVEMENTS UNDER PERMIT FROM THE FOREST SERVICE IN THE WILDERNESS THAT MAY BE BURNED UP BY THE PRESCRIBED FIRES. THIS IS SIMPLY ONE OF THE HAZARDS OF DOING BUSINESS IN OR VISITING A WILDERNESS AREA. HOWEVER, THIS IS A RARE OPPORTUNITY FOR OUTFITTERS, THEIR GUESTS, AND OTHER RECREATIONISTS TO VIEW THE FORCES OF NATURE IN ACTION - FROM A DISTANCE!! AND, EVEN THOUGH THE LAND WILL BE BLACK FOR A WHILE, THE OPEN AREAS CREATED BY THE PRESCRIBED FIRES WILL BE FULL OF WILDFLOWERS AND WILDLIFE IN ONLY A FEW YEARS THAT COULD NOT SURVIVE IN THE DENSE OLD GROWTH FOREST. AND, THERE IS STILL PLENTY OF OLD GROWTH FOREST AS WELL. THESE PRESCRIBED FIRES BURN IN A MOSAIC PATTERN LEAVING ISLANDS OF FOREST UNBURNED AND CONSIDERABLE AREA WITHIN THE BURN PERIMETER WITH ONLY A VERY LIGHT FIRE BURNING UNDERNEATH THE TREES.

AS OF AUGUST 10, 1988, THERE WERE ABOUT 56,000 ACRES WITHIN THE BOUNDS OF THE CANYON CREEK AND GATES PARK WILDERNESS PRESCRIBED FIRES. OF THIS, IT IS ESTIMATED THAT ABOUT 28,000 ACRES HAVE ACTUALLY BEEN BURNED OVER. THIS MEANS THAT THERE ARE LOTS OF UNBURNED AREAS WITHIN THE PRESCRIBED FIRE PERIMETER. IN TERMS OF TOTAL AREA AFFECTED, THE BOB MARSHALL COMPLEX COVERS APPROXIMATELY 1,500,000 ACRES. THEREFORE, THE 56,000 ACRES AFFECTED BY THE PRESCRIBED FIRES MAKES UP ABOUT 4% OF THE WILDERNESS COMPLEX. SO, THERE ARE PLENTY OF PLACES TO GO RIGHT NOW IN THE BOB MARSHALL, SCAPEGOAT, AND GREAT BEAR WILDERNESS AREAS WITHOUT BEING AFFECTED BY THE PRESCRIBED FIRES.

THE FOREST SUPERVISORS ADMINISTERING THE BOB MARSHALL COMPLEX HAVE GONE ON RECORD STATING THAT THEY WILL FIND ANOTHER LOCATION IN THE WILDERNESS FOR ANY OUTFITTERS THAT LOSE OR HAVE TO MOVE THEIR CAMPS BECAUSE OF THE PRESCRIBED FIRES. IN ADDITION, IN ONLY A FEW SHORT YEARS, WILDLIFE SHOULD ABOUND IN AND AROUND THE PRESCRIBED BURN AREAS.

ANOTHER IMPACT IS SMOKE DOWNWIND FROM THE PRESCRIBED FIRES. WE KNOW THAT FIRE HAS HISTORICALLY PLAYED A MAJOR ROLE IN SHAPING THE WILDLAND ECOSYSTEMS OF NORTH AMERICA. SMOKE, LIKE FIRE, HAS ALSO BEEN A NATURAL COMPONENT OF OUR ECOSYSTEMS FOR MILLIONS OF YEARS. FIRE AND SMOKE CAN NOT BE TOTALLY ELIMINATED FROM OUR WILDLAND ECOSYSTEMS WITHOUT SERIOUS ADVERSE CONSEQUENCES. WE MUST LOOK AT THE POSITIVE SIDE OF THE PICTURE AND RECOGNIZE THAT SMOKE APPEARS TO HAVE SOME BENEFICIAL BIOLOGICAL ASPECTS. HISTORICALLY SMOKE FROM FIRES STARTED BY LIGHTNING AND NATIVE AMERICANS OBSCURED VISIBILITY FOR DAYS ON END EACH YEAR IN MANY PARTS OF OUR COUNTRY. SOME SCIENTISTS NOW BELIEVE THAT SMOKE HAS SEVERAL BENEFICIAL PROPERTIES IN WILDLAND ECOSYSTEMS. PRELIMINARY RESEARCH INDICATES THAT SMOKE ACTS AS A FUMIGANT AS IT PASSES THROUGH THE FOREST CANOPY, CHECKING THE SPREAD OF VARIOUS INSECTS, BACTERIA, VIRUSES AND OTHER FOREST PATHOGENS. IF WE ELIMINATE SMOKE FROM WILDLAND ECOSYSTEMS, WE MAY ADVERSELY AFFECT ONE OF NATURE'S IMPORTANT CHECKS AND BALANCES.

FORTUNATELY, SMOKE FROM THE PRESCRIBED FIRES BURNING IN THE WILDERNESS AFFECT DOWNWIND COMMUNITIES FOR ONLY A SHORT PERIOD OF TIME EACH DAY THAT WINDS CARRY THE SMOKE IN THEIR DIRECTION. TO HELP US MONITOR AIR QUALITY AS A RESULT OF THESE PRESCRIBED FIRES, THE U.S. FOREST SERVICE IS COOPERATING WITH THE STATE OF MONTANA, LEWIS AND CLARK AND CASCADE COUNTIES TO STEP UP THE MONITORING OF AIR

QUALITY IN THE TOWNS OF HELENA AND GREAT FALLS AND ESTABLISH TEMPORARY AIR MONITORING STATIONS IN LINCOLN AND CHOTEAU. THIS INCREASED MONITORING MAY REVEAL THAT SMOKE GENERATED BY THESE PRESCRIBED FIRES IS NOT PRESENT IN SIGNIFICANT CONCENTRATIONS TO POSE A HEALTH PROBLEM, OR TO BE SO INFREQUENT A PROBLEM AS TO BE INSIGNIFICANT.

U.S. FOREST SERVICE HYDROLOGISTS ARE ALSO WORKING CLOSELY WITH DOWNSTREAM WATER USER GROUPS TO DETERMINE POTENTIAL DOWNSTREAM IMPACTS.

THE DECISIONS THESE MANAGERS HAVE TO MAKE ARE TOUGH ONES BUT ONES THAT HAVE TO BE MADE! WE EITHER HAVE TO PAY THE FIDDLER NOW OR WAIT, AND THE LONGER WE WAIT, THE TOUGHER IT WILL BE. THEY KNOW WE HAVE TO PLAY CATCH UP AND TAKE CARE OF THE PROBLEM NOW OR GIVE IT TO OUR CHILDREN. THE LONGER WE WAIT, THE MORE LARGE AND DEVASTATING FIRES THAT WILL OCCUR. WE MUST BALANCE OUR FIRE FIGHTING EFFORTS WITH PRESCRIBED FIRE. WE NOW KNOW THAT FIRE EXCLUSION CREATES FUELS THAT EVENTUALLY BECOME TOO MUCH FOR OUR FIRE FIGHTERS TO HANDLE, ROB OUR FORESTED LANDS OF FORAGE FOR LIVESTOCK AND WILDLIFE, AND CAUSE INTENSE FIRES THAT DESTROY VALUABLE TIMBER, WATERSHEDS,AND THREATEN OUR HOMES IN AND ADJACENT TO THE FORESTS.

IF WE WAIT TOO MANY YEARS, THE BEST FIRE FIGHTING FORCES IN THE WORLD WILL NOT BE ABLE TO CONTROL ALL FIRES WHEN THEY START DURING HOT, DRY AND WINDY SUMMERS LIKE WE ARE HAVING IN 1988. WE HAVE NOW RECOGNIZED THAT, PLANNED FOR IT, AND ARE NOW MANAGING THE SITUATION IN THE BOB MARSHALL WILDERNESS COMPLEX.

IF THIS MAKES YOU THINK THAT SMOKY THE BEAR IS NO LONGER NEEDED, YOU COULDN'T BE MORE WRONG! A FIRE IN THE WRONG PLACE AT THE WRONG TIME IS A WILDFIRE AND MUST BE PUT OUT AS FAST AS POSSIBLE. OLD SMOKY, JUST THE REST OF US, IS STILL LEARNING, AND, I'M SURE HIS MESSAGE WILL BE JUST AS STRONG AS EVER IN THE FUTURE. HE WILL SIMPLY HAVE GRADUATED INTO A NEW ERA OF FIRE MANAGEMENT.

APPENDIX Q

WEATHER FROM GATES PARK

Sept. - Oct.

TIME	SKY	WIND	DB	WB	RH	COMMENTS
0745	10% cloud cover	gusting to 10 mph	28°			
1000	cloudy over divide	NW 3-8 gusts to 11	28°			
1200	cloud cover 5%	NW 3-8 gusts	34°	30	67%	
9/21 1400	cloud cover 5%	W 5-10 shifting	40°	35	65%	
1630	cloud cover 25%	W 5-8 gusts 15	38°	34	71%	
0800	cloudy 40%	NW 2-5	28°			slight inversion
9/27 0815	5-6 miles	calm	40°	39.5	100	light rain .04 ppt. Gates Park
9/28 0750	clear	calm	25°			Gates Park 19/100 .19 ppt.
9/29 0816	clear	calm	68°	51°	37	W-W 5-6 gusts 10-12
9/30 1130	clear	3-4 NW	64°	60°	39%	NW 3-4 8-10
1400	clear	6-7 W	70°	64°	37%	gusting 10-12
10/1 0800	clear		26°			
1000	clear	2 -3 SW	49°	42°	58%	
1638	clear	3-6 S	65°	52°	43%	
10/2 0900	clear	calm	34°	31°	74%	
1400	clear	1-3 S-SW	64°	49°	35%	

TIME	SKY	WIND	DB	WB	RH	COMMENTS
10/3 0910	mostly clear	calm	40°	36°	71%	
1438	25-30% high cloud	2-5 S gusts 10-12	60°	47°	41%	
10/4 0945	clear, light valley fog	calm	34°	32°	83%	light cloud cover
1410	clear	2-5 SW	65°	47°	25%	
1605	clear	3-6 SW	66°	46°	20%	
10/5 0940	clear w/ light fog	calm	38°	34°	69%	
1400	clear	1-3 S-SE	69°	48°	20%	
10/6 1020	5-10% cloud cover	calm	45°	37°	49%	
1400	mostly clear	3-4 S-SE	68°	46°	16%	
10/7 1115	clear	calm	54°	43°	42%	
1400	clear	6-7 NW	71°	50°	22%	gusts 10-12
10/8 1400	hazy	7-8 NW	68°	48°	22%	
10/9 1040	Clear - top, hazy - bottom	slight	51°	43°	54%	
1400	clear w/a few afternoon clouds	3-5 S	68°	50°	28%	
10/10 1013	clear w/ light valley smoke	calm	45°	40°	67%	
1400	clear	3-5 S	74°	52°	22%	
10/11 1010	clear	calm	45°	40°	67%	

TIME	SKY	WIND	DB	WB	RH	COMMENTS
1400	clear	5-7 west	72°	51°	23%	
10/12 1105	clear, light fog & smoke	calm	54°	45°	52%	
1520	clear	5 NW	70°	48°	18%	
10/13 1109	clear, stagnant smoke in valley	calm	52°	41°	40%	
1539		5-7 S/SW gusts 10-15	66°	48°	26%	
10/14 1030	95% cloud cover, light rain	3-5 S/SW	51°	44°	60%	
1405	mostly cloudy	5-7 SW gust 10-15	54°	45°	52%	
10/15	Lt rain, mostly cloudy	calm	47°	45°	87%	0.11" precip.
10/17 1400	30% cc	N-NW 6-8 6-12	43°	38°	66%	
10/19 0825	100% cloud cover	6-8 6-12 N/NW	41°	38°	78%	.03" precip overnight
1400	100% cloud cover	4-8 W/NW	45°	40°	67%	
10/21 0800	95% cloud cover	calm	47°	40°	57%	
10/22 0740	50% cloud cover	8 mph NW	42°	34°	52%	.12" precip. overnight; 15-25 mph w/gusts to 50 overnight
10/23 0825	80% cloud cover	6 mph N	48°	36°	30%	
10/24 0758	80% cloud cover	5 mph N	46°	40°	62%	

TIME	SKY	WIND	DB	WB	RH	COMMENTS
10/25	clear	calm	19°			
10/26 0805	cloudy trace of precip	5 mph W	45°	41°	73%	
1600	snow	10 mph N-NW	28°			
10/27 0800	overcast	calm	18°			.25 precip. 6" snow on ground
10/28 0940	overcast	calm	12°			very cold, 7° @7:30

APPENDIX R

GATES PARK FIRE INTENSITY MAP

In back packet.

APPENDIX S

FIRE BEHAVIOR COMPUTATIONS
FOR

July 25-28 Fire Behavior/Fuels Report

WORKSHEET FOR PREDICTING FIRE BEHAVIOR

Fire Name Gates Park Rx Fire Date 7-25-99

(All references to sections or tables are in Field Guide)

SITE AND OTHER INPUT DATA FOR CALCULATIONS	Projection Pt:	1	2
(1) Fuel Model, 1 - 13 (See Section 1)		10	10
(2) Time, 2400 clock		1330	1330
(3) Elevation		±5500' FEET	±5500' FEET
(4) Aspect; E,W,S, or N		East	SE
(5) Temperature		79 °F	79 °F
(6) Relative Humidity (See Section 2)		21 %	21 %
(7) Shading from clouds, cover, etc.		30 %	20 %
(8) Reference Fuel Moisture (Table 3A or 3E)		3 %	3 %
(9) Dead Fuel Moisture Correction (Table 3B, 3C or 3D)		+ 0	+ 0
(10) Dead Fuel Moisture (Line 8 + Line 9)		= 3 %	= 3 %
(11) Live Fuel Moisture (Table 3F)		80 %	80 %
(12) Windspeed, 20-foot		— MPH	MPH
(13) Windspeed Adjustment Factor (Table 4A)		X —	X
(14) Midflame Windspeed (Line 12 X Line 13)		= 2 MPH	= 0 MPH
(15) Wind Factor (Table 4B)		3	0
(16) Slope to nearest 5 percent (See Section 5)		0 %	0 %
(17) Slope Factor (Table 5B)		0	0
(18) Wind Factor (Repeat Line 15)		+ 3	+ 0
(19) Effective Windspeed Factor (Line 18 + Line 17)		= 3.0	= 0
(20) Constant from Formula		+ 1	+ 1
(21) Total Correction Factor		= 4.0	= 4.0
FIRE BEHAVIOR CALCULATIONS AND OUTPUT VALUES			
(22) Rate of Spread for No Wind or Slope (Table 6A)		1.0 CH/HR	1.0 CH/HR
(23) Total Correction Factor (Repeat Line 21)		X 4	X 1
(24) Adjusted Rate of Spread (Line 22 X Line 23)		= 4.0 CH/HR	= 1.0 CH/HR
(25) Fireline Intensity for No Wind or Slope (Table 6B)		27 BTU/F/S	27 BTU/F/S
(26) Total Correction Factor (Repeat Line 21)		X 4	X 1
(27) Adjusted Fireline Intensity (Line 25 X Line 26)		= 108 BTU/F/S	= 27 BTU/F/S
(28) Flame Length (Table 6C)		4 FEET	2 FEET
(29) Probability of Ignition (Table 6D)		80 %	80 %
(30) Adjusted Rate of Spread (Repeat Line 24)		4 CH/HR	1 CH/HR
(31) Projection Time		X 4 HOURS	X 4 HOURS
(32) Forward Spread Distance (Line 30 X Line 31)		= 16 CHAINS	= 4 CHAINS
(33) Effective Windspeed Factor (Repeat Line 19)			
(34) Effective Windspeed (Table 7A)		MPH	MPH
(35) Area for Point Source Fire (Table 7B)		ACRES	ACRES
(36) Perimeter for Point Source Fire (Table 7C)		CHAINS	CHAINS

Projection Point 1 = Downslope & Downwind 28 East of Gates Ridge spot fire

2 = Backing fire burning into itself - Hot spot in Gates Creek.

WORKSHEET FOR PREDICTING FIRE BEHAVIOR

Fire Name Gates Park R Fire Date 7-25-93

(All references to sections or tables are in Field Guide)

SITE AND OTHER INPUT DATA FOR CALCULATIONS	Projection Pt.	3	4
(1) Fuel Model, 1 - 13 (See Section 1)		10	10
(2) Time, 2400 clock		1330	1330
(3) Elevation		6300 FEET	5600 FEET
(4) Aspect: E,W,S, or N		SW	E
(5) Temperature		79 °F	79 °F
(6) Relative Humidity (See Section 2)		23 %	21 %
(7) Shading from clouds, cover, etc.		30 %	30 %
(8) Reference Fuel Moisture (Table 3A or 3E)		3 %	3 %
(9) Dead Fuel Moisture Correction (Table 3B, 3C or 3D)		+ 0	+ 0
(10) Dead Fuel Moisture (Line 8 + Line 9)		= 3 %	= 3 %
(11) Live Fuel Moisture (Table 3F)		80 %	80 %
(12) Windspeed, 20-foot		— MPH	— MPH
(13) Windspeed Adjustment Factor (Table 4A)		X —	X —
(14) Midflame Windspeed (Line 12 X Line 13)		= ~6 MPH	= 2 MPH
(15) Wind Factor (Table 4B)		13	3
(16) Slope to nearest 5 percent (See Section 5)		0 %	0 %
(17) Slope Factor (Table 5B)		0	0
(18) Wind Factor (Repeat Line 15)		+ 13	+ 3
(19) Effective Windspeed Factor (Line 18 + Line 17)		= 13	= 3
(20) Constant from Formula		+ 1	+ 1
(21) Total Correction Factor		= 14	= 4
FIRE BEHAVIOR CALCULATIONS AND OUTPUT VALUES			
(22) Rate of Spread for No Wind or Slope (Table 6A)		1.0 CH/HR	1.0 CH/HR
(23) Total Correction Factor (Repeat Line 21)		X 14	X 4
(24) Adjusted Rate of Spread (Line 22 X Line 23)		= 14 CH/HR	= 4 CH/HR
(25) Fireline Intensity for No Wind or Slope (Table 6B)		27 BTU/F/S	27 BTU/F/S
(26) Total Correction Factor (Repeat Line 21)		X 14	X 4
(27) Adjusted Fireline Intensity (Line 25 X Line 26)		= 378 BTU/F/S	= 108 BTU/F/S
(28) Flame Length (Table 6C)		6-7' FEET	4' FEET
(29) Probability of Ignition (Table 6D)		80 %	80 %
(30) Adjusted Rate of Spread (Repeat Line 24)		14 CH/HR	4 CH/HR
(31) Projection Time		X 4 HOURS	X 4 HOURS
(32) Forward Spread Distance (Line 30 X Line 31)		= 56 CHAINS	= 16 CHAINS
(33) Effective Windspeed Factor (Repeat Line 19)			
(34) Effective Windspeed (Table 7A)		MPH	MPH
(35) Area for Point Source Fire (Table 7B)		ACRES	ACRES
(36) Perimeter for Point Source Fire (Table 7C)		CHAINS	CHAINS

Projection Point 3 = Red Shale Creek Cross slope

4 = North of trail 164 on Ridge west of No. FK. Sun River

WORKSHEET FOR PREDICTING FIRE BEHAVIOR

Fire Name Gate Park Rx Fire Date 7-26-88

(All references to sections or tables are in Field Guide)

SITE AND OTHER INPUT DATA FOR CALCULATIONS	Projection Pt.	5	6
(1) Fuel Model, 1 - 13 (See Section 1)		10	10
(2) Time, 2400 clock		1530	1530
(3) Elevation		5900 FEET	5600 FEET
(4) Aspect; E,W,S, or N		SW	E
(5) Temperature		90 °F	90 °F
(6) Relative Humidity (See Section 2)		14 %	14 %
(7) Shading from clouds, cover, etc.		<50 %	<50 %
(8) Reference Fuel Moisture (Table 3A or 3E)		~~<50~~ 2 %	~~<50~~ 2 %
(9) Dead Fuel Moisture Correction (Table 3B, 3C or 3D)		+ - 0	+ 0
(10) Dead Fuel Moisture (Line 8 + Line 9)		= 2 %	= 2 %
(11) Live Fuel Moisture (Table 3F)		60-80 %	60-80 %
(12) Windspeed, 20-foot		— MPH	— MPH
(13) Windspeed Adjustment Factor (Table 4A)		X —	X —
(14) Midflame Windspeed (Line 12 X Line 13)		= 5 MPH	= 5 MPH
(15) Wind Factor (Table 4B)		10	10
(16) Slope to nearest 5 percent (See Section 5)		25-30 %	25-30 %
(17) Slope Factor (Table 5B)		1.6	1.6
(18) Wind Factor (Repeat Line 15)		+ 10	+ 10
(19) Effective Windspeed Factor (Line 18 + Line 17)		= 11.6	= 11.6
(20) Constant from Formula		+ 1	+ 1
(21) Total Correction Factor		= 12.6	= 12.6
FIRE BEHAVIOR CALCULATIONS AND OUTPUT VALUES			
(22) Rate of Spread for No Wind or Slope (Table 6A)		1.2 CH/HR	1.2 CH/HR
(23) Total Correction Factor (Repeat Line 21)		X 12.6	X 12.6
(24) Adjusted Rate of Spread (Line 22 X Line 23)		= 15.12 CH/HR	= 15.12 CH/HR
(25) Fireline Intensity for No Wind or Slope (Table 6B)		34 BTU/F/S	34 BTU/F/S
(26) Total Correction Factor (Repeat Line 21)		X 12.6	X 12.6
(27) Adjusted Fireline Intensity (Line 25 X Line 26)		= 428 BTU/F/S	= 428 BTU/F/S
(28) Flame Length (Table 6C)		7-8 FEET	7-8 FEET
(29) Probability of Ignition (Table 6D)		100 %	100 %
(30) Adjusted Rate of Spread (Repeat Line 24)		15 CH/HR	15 CH/HR
(31) Projection Time		X 3 HOURS	X 3 HOURS
(32) Forward Spread Distance (Line 30 X Line 31)		= 45 CHAINS	= 45 CHAINS
(33) Effective Windspeed Factor (Repeat Line 19)		11.6	11.6
(34) Effective Windspeed (Table 7A)		6 MPH	6 MPH
(35) Area for Point Source Fire (Table 7B)		± 100 ACRES	± 100 ACRES
(36) Perimeter for Point Source Fire (Table 7C)		130 CHAINS	130 CHAINS

Projection Point 5 = Cross slope wind
backing into Red Shale

6 = Head of fire near No. FK. Sou. Rv.

WORKSHEET FOR PREDICTING FIRE BEHAVIOR

Fire Name Gates Park 2 Fire Date 7-28-88

(All references to sections or tables are in Field Guide)

SITE AND OTHER INPUT DATA FOR CALCULATIONS	Projection Pt.	7	8
(1) Fuel Model, 1 - 13 (See Section 1)		10	10
(2) Time, 2400 clock		1300-1800	1300-1800
(3) Elevation		5800 FEET	5800 FEET
(4) Aspect; E,W,S, or N		SW	NE
(5) Temperature		85 °F	85 °F
(6) Relative Humidity (See Section 2)		18 %	18 %
(7) Shading from clouds, cover, etc.		<50 %	<50 %
(8) Reference Fuel Moisture (Table 3A or 3E)		2 %	2 %
(9) Dead Fuel Moisture Correction (Table 3B, 3C or 3D)		+ 0	+ 0
(10) Dead Fuel Moisture (Line 8 + Line 9)		= 2 %	= 2 %
(11) Live Fuel Moisture (Table 3F)		80 %	80 %
(12) Windspeed, 20-foot		5-15 MPH	5-15 MPH
(13) Windspeed Adjustment Factor (Table 4A)		X .25	X .08
(14) Midflame Windspeed (Line 12 X Line 13)		= 1-4 MPH	= .4-1.2 MPH
(15) Wind Factor (Table 4B)		1-7	1
(16) Slope to nearest 5 percent (See Section 5)		25 %	30 %
(17) Slope Factor (Table 5B)		1.1	1.6
(18) Wind Factor (Repeat Line 15)		+ 1-7	+ 1
(19) Effective Windspeed Factor (Line 18 + Line 17)		= 2.1-8.1	= 2.6
(20) Constant from Formula		+ 1	+ 1
(21) Total Correction Factor		= 3.1-9.1	= 3.6
FIRE BEHAVIOR CALCULATIONS AND OUTPUT VALUES			
(22) Rate of Spread for No Wind or Slope (Table 6A)		1.2 CH/HR	1.2 CH/HR
(23) Total Correction Factor (Repeat Line 21)		X 3.1-9.1	X 3.6
(24) Adjusted Rate of Spread (Line 22 X Line 23)		= 3.7-11 CH/HR	= 4.32 CH/HR
(25) Fireline Intensity for No Wind or Slope (Table 6B)		35 BTU/F/S	35 BTU/F/S
(26) Total Correction Factor (Repeat Line 21)		X 3.1-7.1	X 3.6
(27) Adjusted Fireline Intensity (Line 25 X Line 26)		= 109-318 BTU/F/S	= 126 BTU/F/S
(28) Flame Length (Table 6C)		4-6 FEET	4 FEET
(29) Probability of Ignition (Table 6D)		100 %	100 %
(30) Adjusted Rate of Spread (Repeat Line 24)		CH/HR	CH/HR
(31) Projection Time		X HOURS	X HOURS
(32) Forward Spread Distance (Line 30 X Line 31)		= CHAINS	= CHAINS
(33) Effective Windspeed Factor (Repeat Line 19)			
(34) Effective Windspeed (Table 7A)		MPH	MPH
(35) Area for Point Source Fire (Table 7B)		ACRES	ACRES
(36) Perimeter for Point Source Fire (Table 7C)		CHAINS	CHAINS

Projections for crossing Red Shale Creek and moving up the North side of Drainage

Projection Pt. 7 = backing fire

8 = wind blowing downslope, fire moving upslope

APPENDIX T

PHOTO RECORD AND TYPICAL FUELS

on file at

Rocky Mountain Ranger District
Choteau, Montana

APPENDIX V

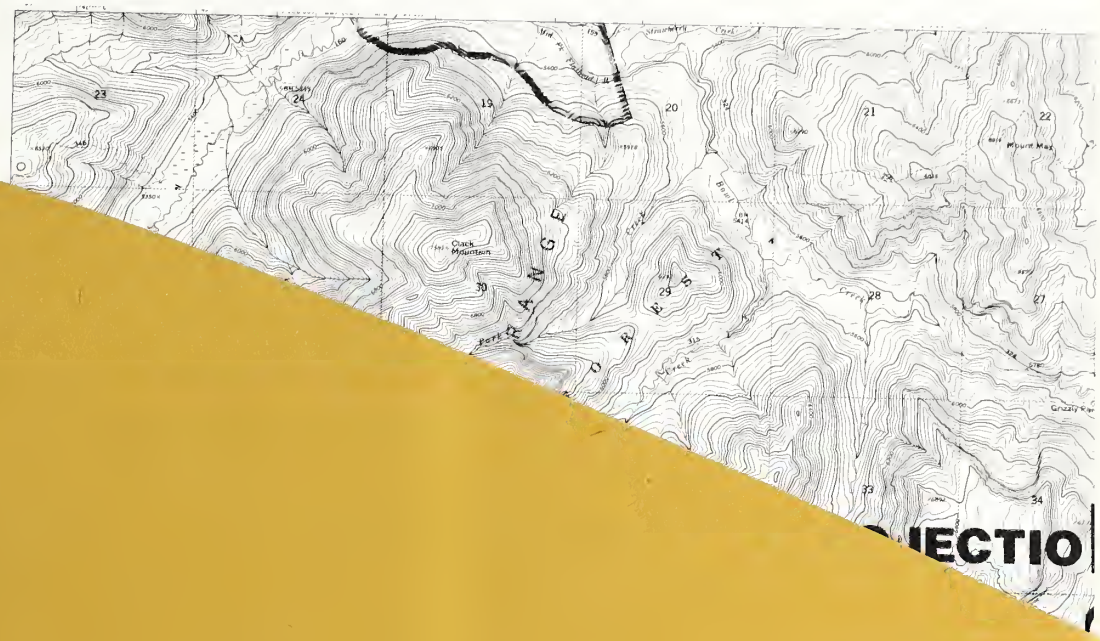
MAP CHRONOLOGY FIRE SPREAD and ACTIONS TAKEN

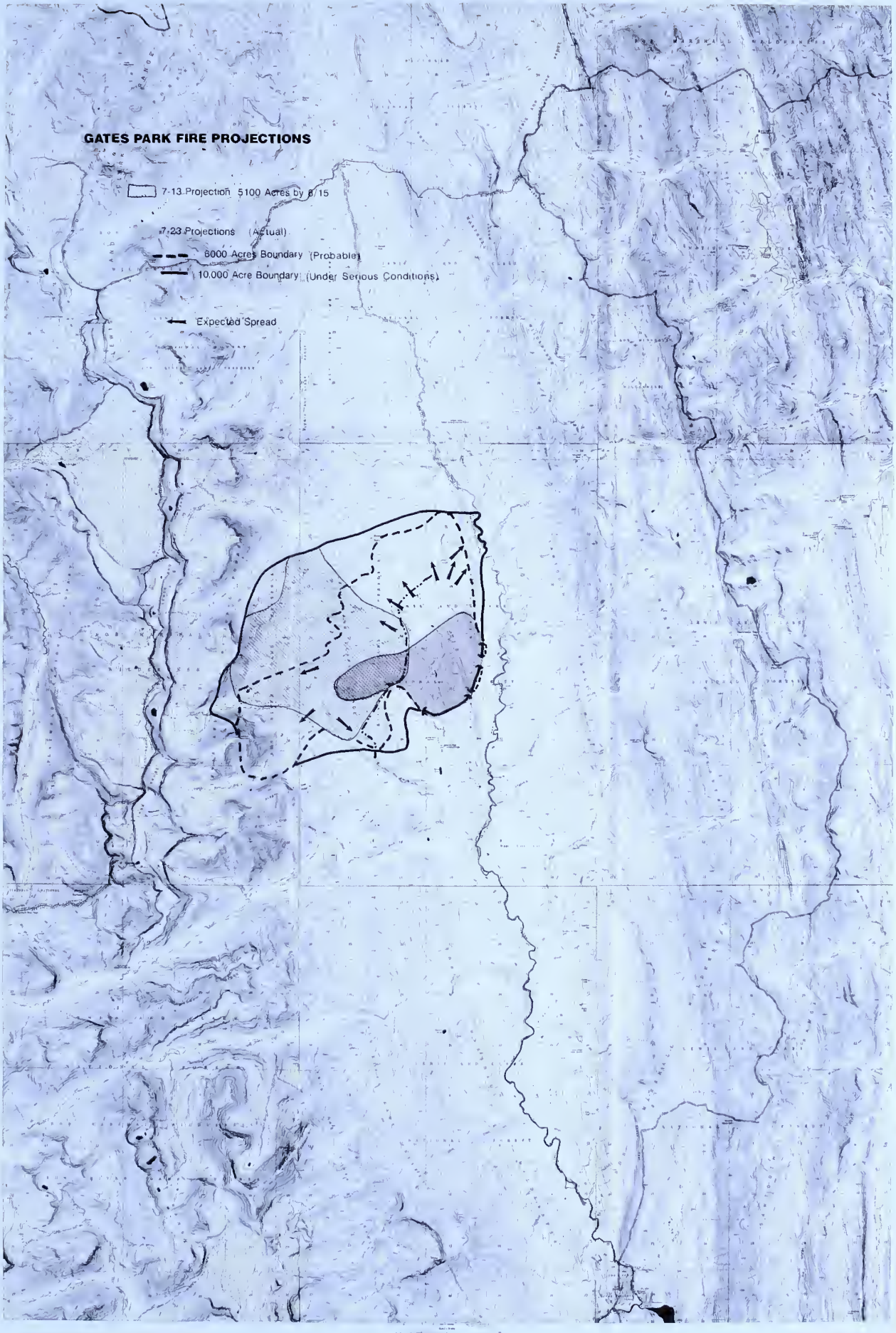
In back packet.

APPENDIX W

GATES PARK FIRE PROJECTIONS MAP 7/13 AND 7/23

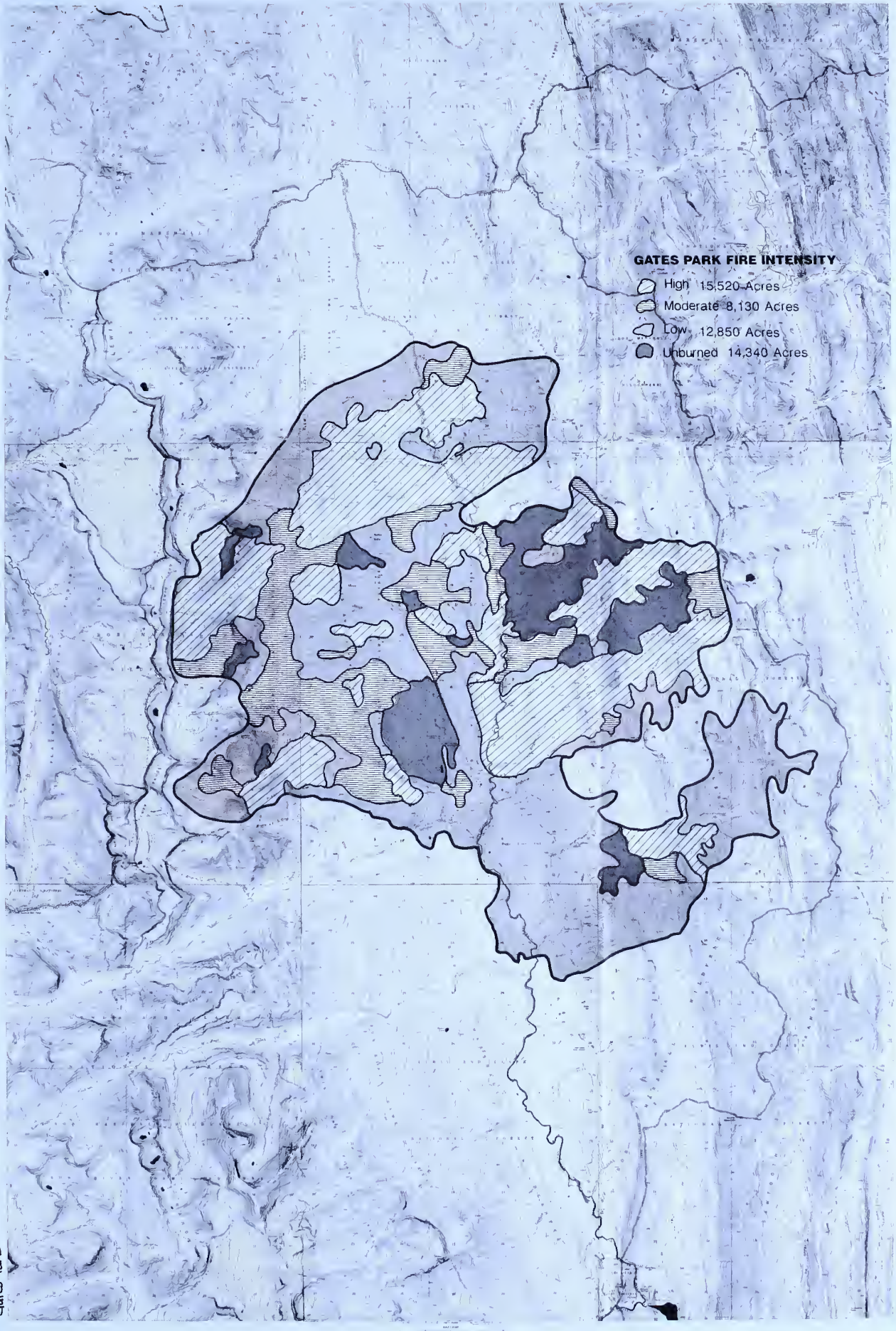
In back packet.


Mount Max
Crack Mountain
Bear Creek
Grizzly Creek
ECTIO


GATES PARK FIRE PROJECTIONS
7-13 Projection 5100 Acres by 8/15
7-23 Projections (Actual)
8000 Acres Boundary (Probable)
10,000 Acre Boundary (Under Serious Conditions)
Expected Spread

Gates Park

GATES PARK FIRE 1988
MAP CHRONOLOGY
Origin
Backing Fire
Head Fire
Hand Line
Blasted Line
Aerial Retardant
Cold Trailed
H-1 Helispot
Camp
North Camp
Helicopter
Water Drops
Unburned
Gates Lake
Hidden Lake Fire
Wilderness
Grouse Creek Camp
Secondary
Gates Park


GATES PARK FIRE INTENSITY
High 15,520 Acres
Moderate 8,130 Acres
Low 12,850 Acres
Unburned 14,340 Acres
Gates Park